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CONCERNING THE REPORTING OF INTENSITY AND PITCH IN THE HEARING TESTS.

DR. DOUGLAS MACFARLAN, Philadelphia.

"The pitch of a sound is that tone characteristic of being acute or grave which determines its position in the musical scale; an acute sound is of high pitch, a grave sound is of low pitch. Experiment proves that pitch depends upon a very simple condition, the number of complete vibrations per second; this number is called the frequency of the vibration." (Dayton C. Miller.)

Intensity is synonymous with loudness and depends upon the amplitude of the vibration of the sounding body.

The increased interest in more accurate hearing tests has developed a necessity that otologists be more familiar with some of the commonplace acoustic principles. Strange as it may seem, many men are still encountered who do not have clear ideas as to the entities of pitch and intensity. Some do not understand that pitch and frequency and the "number of vibrations per second" are synonymous and that loudness is the attribute of intensity.

In the past much confusion has arisen from the fact that cases have been reported as not hearing certain pitches, no mention being made of the intensity of the pitch tested. It is confusing to some men to find that a patient does not hear a certain pitch with one testing method and does hear it with another testing method. It

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should be immediately obvious that the intensity capabilities of the two instruments at the particular pitch tested, vary. For example, the B.C. receiver on an audiometer may show no hearing to the 8192 pitch, whereas the monochord may show distinct hearing of this pitch. To avoid this error, reporting, where possible, should always be made of the intensity of the hearing for the pitch. Where this cannot be done on account of the limitations of the instrument (as in the case of the monochord) there should be noted the type of testing instrument used. For example, John Doe: reported no hearing by B.C. to the 2A audiometer, pitch 2048 at maximum intensity; distinct B.C. hearing to monochord at pitch 2048. No B.C. hearing to 2048 fork (the normal B.C. of which was twelve seconds).

Where finer quantitative work is desired, the electric audiometers are practically essential. Most of the research workers prefer a decibel potentiometer to that potentiometer which reads in percentages of hearing. The latter are rapid and convenient for office work; but the decibel potentiometer gives actual physical units that are not referred to as percentages of hearing.

The audiometers now on the market read in percentages of hearing. I have always felt that we are not sufficiently experienced in audiometers as yet to state what the normal is, and it seems much more desirable to state the hearing loss in the number of sensation units or decibels.

As to pitch nomenclature, much confusion has existed for years from the changes in pitch notation made by various acoustic authorities. Ellis, quoted by Miller, gives a table of 242 different standard pitches that have been selected from time to time. A few of these still remain in common use. For otologists, it is important to know the enumeration of no more than four.

1. Koenig, Scientific Philosophical Pitch. C-256. Established by Koenig for his own work and still widely used for scientific purposes.
2. Hartman, C-128.
3. International, A_3=435. C=32.33.
4. Bezold-Edelmann, C=64; c=128.

It is particularly to be noted that the Hartman forks correspond to Koenig's and to others in the number of vibrations per second: yet the octave enumeration is different. Thus, Koenig's C is 256, while Hartman's C is 128, and the International C is 32.33.

The enumeration on the Edelmann forks corresponds with that on the Hartman and Bezold forks. This is probably the most familiar nomenclature: C-64; c-128; $c^1$256; $c^2$512, etc.

Occasionally, a fork is seen which is marked numerically with the single vibrations instead of double vibrations; the number is twice as great as that of a corresponding pitch marked as to double vibrations. Thus, 256 single vibrations equals 128 double vibrations. The sign ∞ is useful to denote double vibrations. The letters "d.v." are also used.

The International pitch of 1891 is based upon the A in the octave above middle C. This has a frequency of 435 and with this standard the value of the middle C is 258, as shown in the table of equally tempered scale. Other names for the International pitch are: French (1859) Diapason normal, International (1891) International low, and violin A.

Dayton C. Miller urges the use of one pitch for both scientific and musical purposes, and suggests the most logical one, A-435.

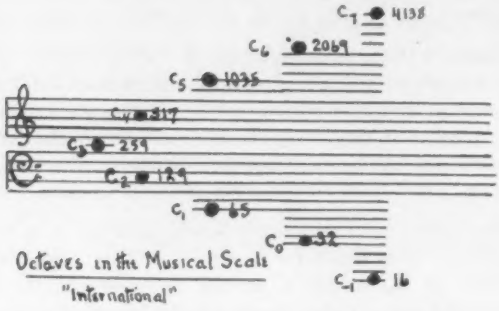
For otologists, the small differences of pitch between these various scales matters but little. Marked differences in pitch hearing is unusual between two pitches of a nearly equal frequency (Fowler).

It would seem best, that, in recording pitches we merely state the numerical frequency used. The moment we note the pitches C-1, C-2 or C3 the reader will wonder which basic pitch applies. C-1 would mean Koenig—256, Hartman—128, International—64.66.

	$C\text{-}1\text{-}C_0$	$C_0\text{-}C_1$	$C_1\text{-}C_2$	$C_2\text{-}C_3$	$C_3\text{-}C_4$	$C_4\text{-}C_5$	$C_5\text{-}C_6$	$C_6\text{-}C_7$
C	16.17	32.33	64.66	129.33	258.65	517.31	1034.61	2069.22
C#	17.13	34.25	68.51	137.02	274.03	548.07	1096.13	2192.26
D	18.15	36.29	72.58	145.16	290.33	580.66	1161.31	2322.62
D#	19.22	38.45	76.90	153.80	307.59	615.18	1230.37	2460.73
E	20.37	40.74	81.47	162.94	325.88	651.76	1303.53	2607.05
F	21.58	43.16	86.31	172.63	345.26	690.52	1381.04	2762.08
F#	22.86	45.72	91.45	182.89	365.79	731.58	1463.16	2926.32
G	24.22	48.44	96.89	193.77	387.54	775.08	1550.16	3100.33
G#	25.66	51.32	102.65	205.29	410.59	821.17	1642.34	3284.68
A	27.19	54.37	108.75	217.50	435.00	870.00	1740.00	3480.00
A#	28.80	57.61	115.22	230.43	460.87	921.73	1843.47	3686.93
B	30.52	61.03	122.07	244.14	488.27	976.54	1953.08	3906.17
C	32.33	64.66	129.33	258.65	517.31	1034.61	2069.22	4138.44

Table of equally tempered scale, A_3=435 after D. C. Miller —human voice range. —piano range.

EQUALLY TEMPERED SCALE.



Diapason Normal (French), International, Low.

THE NAMING OF THE PITCHES.

		ENUMERATION OF FORKS.				
		Frequency	Beold and Edelman	Koenig	Hartman	International Pitch
Handel	A_2=422	64	C	c_2		c_1—64
Philharmonic	A=461.6					
"Concert," "High Pitch," "London."		128	c	c_1	C	c_2—129
International High	A=440					
"Orchestral," "Scheibler's," "Stuttgart," "1834."		256	c^1	c	c_1	c_3—259
International	A=435					
"International Low" (c_2=259), "Diapason Normal," "French," "Violin A."		512	c^2	c_1	c_2	c_4—517
		1024	c^3	c_2	c_3	c_5—1035
Koenig's	C=256					
"Scientific," "Philosophical."		2048	c^4	c_3	c_4	c_6—2069

Monochord values have long been in confusion. As more and more of us are using the monochord, a table of transverse values follows. The literature on the monochord is scanty and is certainly erroneous in its statement that the range for transverse tones is between 387 and 5524. The lowest available tone is G# above middle C, which is a frequency of 410; the next tone being the A—435 International pitch. Transverse tones cannot be obtained much above 2762.

The use of the instrument to produce longitudinal tones of very high pitch is of undoubted value, but it must be constantly kept in

mind that the intensity of the tones depends upon the force of the frictioning which cannot be controlled. The enumerations on the instrument run up to 24,000 vibrations for longitudinal tones and should be accepted until an accurate check is reported.

VALUE OF TRANSVERSE VIBRATIONS OF MONOCHORD.

	c	d	e	f	g	a	b
String Length	Middle					44.5	38
Frequency	C					435	488
	35.9	32	28.4	27	23.7	21.8	19.4
	517	580	651	690	775	870	976
	17.7	16.	14.3	13.5	12	11	9.7
	1034	1161	1303	1381	1550	1740	1953
	9.1	8.4	7.2	6.9			
	2059	2322	2607	2762			

With the two matters of pitch and intensity more correctly reported, the case records undoubtedly will be more intelligible and more valuable to others.

1805 Chestnut Street.

THE ST. LOUIS AWARD.

On Nov. 3, Dr. Max A. Goldstein, of St. Louis, received the St. Louis Award for 1932-33, in recognition of his achievements and research in dealing with Problems of the Deaf. The certificate, carrying a $1,000.00 prize check, was presented to him in a ceremony at the Mayor's office.

Dr. Goldstein was selected from among twenty-five men and women nominated by citizens.

A hand-lettered parchment, signed by officials of the St. Louis Award, reads: "This certificate is awarded to Doctor Max A. Goldstein, eminent otologist, scientist, and writer, Founder and Director of Central Institute for the Deaf, which, through methods devised and developed by him, has brought happiness and greater usefulness to those handicapped by deafness or defects in speech. His great contributions to humanity have brought the highest honor to Metropolitan St. Louis."

The $1,000.00 prize check was turned over to Central Institute for the Deaf by Dr. Goldstein to apply on its Scholarship Fund.

TWO CASES OF DIFFUSE LABYRINTHITIS COMPLICATING ACUTE SEROUS OTITIS MEDIA.*

DR. R. A. LUONGO, Philadelphia.

Hinsberg lately reported eleven cases of labyrinthitis complicating acute otitis media, eight of which died with signs of meningitis. He ascribes the high mortality to the expectant treatment, based on the theory that in cases of acute otitis media, an operation on the labyrinth ought to be avoided. Hence he comes to the conclusion that an operation should be performed in acute cases as well as in chronic ones.

He says that some authors do not advise operation in a serous labyrinth, but, he asks: who can differentiate between a serous and a suppurative labyrinthitis?

He claims that opening the labyrinth in an acute condition is not any more dangerous than opening it in a chronic condition. The mortality in conservative treatment is 25 per cent and Hinsberg believes it is too high.

Neuman has reported five cases of acute labyrinthitis operated on during the acute stage; one of them died.[1]

This has induced me to report the following cases of labyrinthitis complicating acute otitis media, because they both got well without any surgical intervention.

Case 1: S. R., white male, age 21 years. On March 25, 1931, he complained of left earache of two days' duration.

On examination I found the left drum red, all the landmarks obliterated and a definite bulging in the posterior superior quadrant. Temperature, 100°. I performed a myringotomy and obtained a serous discharge. The next day he was suddenly seized by a stormy attack of vertigo, nausea, vomiting, ataxia and tinnitus of the left ear.

I found the patient lying on the side of the unaffected ear. He seemed to be reasonably comfortable while he was lying still, but at

*Read before the meeting of the Oto-Rhino-Laryngological Staff of the Pennsylvania Hospital.

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the least movement he was seized by a new attack of the above mentioned stormy symptoms.

On examination I found spontaneous rotary nystagmus towards the right (healthy ear), tendency to fall to the left (diseased ear), left ear deaf to shouting voice with the Barany deafener in the right ear.

Temperature, 100°. No signs of mastoid involvement. Ear draining freely; serous discharge.

The Roentgenography of the mastoids was negative. Blood count: W.B.C., 9,000. Culture: Strep. and staph.

These symptoms lasted for three weeks, gradually diminishing.

The temperature was normal, with occasional rises to 99°.

Case 2: B. H., colored female, age 42 years. On April 4, 1931, she complained of discharge from the right ear of one week's duration, followed by a sudden attack of vertigo, nausea, vomiting, ataxia and tinnitus of right ear. On examination I found patient lying on the sound side, reasonably comfortable, but at the slightest movement she would be again seized by a labyrinthine storm. Her attacks were much more severe than in the first case and her pallor and perspiration were extreme. She had rotary nystagmus to the left (sound ear); tendency to fall to the right (diseased ear); right ear deaf to shouting voice with the Barany deafener in the left ear. The right aural canal was full of mucoserous discharge, the eardrum red, with a good size perforation in the posterior inferior quadrant. No signs nor symptoms of mastoid involvement. The X-ray of the mastoids was negative. Temperature, 99°. Blood count: W.B.C., 8,500; H.B.C., 80 per cent; R.B.C., 4,000,000. Culture: Strep. hemoliticus.

This patient recovered in about one month and the symptoms gradually diminished. The temperature was normal, with occasional rise to 99°.

Treatment: These patients were both treated with rest in bed (lying on the sound side), ice bag on the affected ear; luminol gr. 1 and bromides gr. 10 every three hours; free elimination.

About three weeks ago vestibular tests were done on both patients and they gave the following findings:

The labyrinth of the affected side gave no reactions at all. The affected ears were deaf to shouting voice with the Barany deafener in the sound ear (dead labyrinths).

These final findings make me believe that both patients had diffuse suppurative labyrinthitis. The fact that in both cases the mastoids were not apparently involved makes me think that the infection had spread through the oval window directly into the labyrinth.

I did not operate on these cases because the temperature was normal most of the time, with only occasional rises to 99°, the patients were reasonably comfortable while lying quietly on the sound side and the stormy symptoms gradually and steadily diminished, leaving only a sense of giddiness.

COMMENTS.

Spontaneously a question comes into my mind: When do you perform a labyrinthectomy?

About twenty-five years ago, when Hinsberg introduced his operation and the vestibular tests were unknown, making the diagnosis of labyrinth invasion hard, Richards said: "Considering the doubtful value of symptoms as indicative of actual invasion of the labyrinth; the certainty that surgery will destroy the organ of useful hearing; the danger of opening a normal labyrinth into an infected cavity; the certainty that the outer labyrinthine wall will in most cases perforate before the inner wall, the correct surgical attitude is not to enter the labyrinth unless there is direct evidence that the labyrinth is involved."[4]

Hajek says: "The labyrinth should be opened when the patient is suffering from chronic or acute otitis media with symptoms of diffuse acute inflammation of the labyrinth, namely deafness, nystagmus of third degree with the quick component to the healthy side and lack of response to rotation and caloric and with the fistular tests positive. Likewise, when there are present symptoms of intracranial complications, such as temperature above 38° C., headaches and occasionally with positive cerebrospinal fluid evidence. The labyrinth should also be opened in cases of acute and chronic otitis media, when there is fistula, cholesteatoma, sequestrum or tumor present; when there are signs of persistent irritation on the side of the static labyrinth, evidenced by vertigo, nystagmus, nausea and vomiting."[3]

Philips says: "Nonsuppurating cases, resulting from parotitis, hemorrhages or from cerebrospinal meningitis, should never be subjected to operation. The labyrinth should never be operated in cases of serous labyrinthitis."[5]

But differential diagnosis between serous and suppurative labyrinthitis is impossible. One can only differentiate when the decision for operation is not necessary any more, that is when the end-results can be observed; in suppurative labyrinthitis the function will be destroyed, while the serous type usually gives regeneration and return of part or all of the function of the labyrinth. (Serous labyrinthitis may also produce complete destruction of function.)[2, 7, 8]

Keeler gives the following indications for surgery of the labyrinth:

1. Purulent labyrinthitis threatening intracranial complications.

2. In the presence of tinnitus or vertigo causing distress to the patient, unfitting him for normal social contacts.

3. Rarely in the hope of improving hearing.[3]

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1713 Pine Street.

ACUTE MASTOIDITIS WITH UNUSUAL SYMPTOMS OF MENINGEAL IRRITATION. CASE REPORT.*

DR. ARTHUR J. WAGERS, Philadelphia.

Because of the unusual symptoms and suggested pathology arising during the course of illness, the following case is deemed worthy of bringing to your attention.

W. L., a white boy, age 3 years, was referred by Dr. V. A. Callery, of Pottsville, Pa., to the Bronchoscopic Department of Jefferson Hospital on June 17, 1931. Dr. Callery stated that on June 5 the child had suffered from a convulsive seizure and severe diarrhea, at which time he passed several round worms.

From the time of this convulsion to his admission at the hospital, he had refused all food, thus necessitating forced feeding. On June 9 he became semiconscious and continued in this condition to time of coming to the hospital.

Dr. Callery, suspecting some form of intracranial infection, summoned another physician in consultation. The latter believed he detected a pneumonic patch on the lung. Roentgen ray study made on June 15 showed an area which suggested possible lung abscess. It was because of this finding that the patient was referred to the bronchoscopic department.

The record of past history shows that two years previously this patient had had pneumonia, complicated by right-sided empyema, which had been drained and treated by Dakin irrigation until complete recovery at the end of six weeks.

Since that time the child had been perfectly well until onset of present illness.

At time of entering the hospital the patient appeared very dull and listless but apparently comfortable. Temperature, 106°; pulse, 150; respiration, 48. Respiration was very shallow. There was moist, nonproductive cough. The skin was dry; there was no cyanosis. Eyes dull, no photophobia. Pupillary reactions appeared nor-

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mal. There were no further convulsive seizures. Patient would lie motionless with eyes wide open for hours at a time. He had vomited but once and was able to retain liquids.

PHYSICAL EXAMINATION (DR. CHANG).

Chest: Expansion lessened in right costal margin. Percussion note resonant throughout left lung. Anteriorly, right lung is resonant; posteriorly, in the lower half, the percussion note is definitely impaired.

Breath sounds: Left lung sounds harsher than normal. Right lung, rales heard over area of impaired percussion note. Also friction rub.

Heart: No displacement, sounds well heard, no murmurs.

Abdomen: Scaphoid, no distention. No areas of tenderness or rigidity. Liver and spleen not felt. No free fluid.

Extremities: No clubbing. Reflexes appear normal. No edema. No Kernig's sign. Pulse rapid, volume good, regular.

Ears and nose: Grossly negative. No dilation of nasi.

Throat: Tonsils hypertrophied. Throat injected.

Neck: No rigidity, no adenopathy.

Mouth: Dry.

Impression: Right bronchopneumonia.

On June 18, Dr. Edward Bauer examined patient and reported as follows: "Child is decidedly anemic and toxic. Probably has a right-sided pneumonia and rickets. Neurologic signs may be due to hydrocephalus or meningismus. Mental retardation is probably due to hydrocephalus. Suggest examination of the ears and treat with alkalis, stimulation and whiskey. Lumbar puncture is indicated."

On same day, June 18, routine blood examination showed hemoglobin, 58 per cent; R.B.C., 3,350,000; W.B.C., 18,000; C.I., .87; polymorphonuclears, 90 per cent; small mononuclears, 10 per cent.

Provisional diagnosis, June 18: Right bronchopneumonia.

June 19: Roentgenologic department reported on study of chest as follows: "There is an increase in the marking throughout the right side of the chest. In the upper lobe it resembles pneumonia which is either developing or undergoing some resolution but which is not fully resolved. The lower half of the right chest is quite evenly dense, due, I believe, to changes in the pleura, and that part of the chest is distinctly retracted. There is some evidence of abnormality involving the first rib on the right side. I believe this is due

to underdevelopment. The heart is drawn very slightly to the right side, but at the fluoroscope both halves of the diaphragm move equally freely. I should say there is no free fluid in the right pleural cavity." (Farrell).

Spinal puncture was done and fluid returned clear, June 20. A provisional diagnosis of bronchopneumonia having been made and no evidence of lung abscess or other condition requiring bronchoscopic treatment having been found, the child was transferred to Dr. Bauer's (pediatric) service.

The temperature continued high—from 103° to 105°.

June 21: At Dr. Bauer's request the writer examined the ears and found evidence of acute suppurative otitis media, bilateral. Both membrana tympani were incised and free drainage established.

A second spinal puncture showed clear fluid.

The ears were seen and treated daily, but with no immediate improvement. Profuse discharge continued.

As the child appeared not to notice anything going on about him, there was a question as to his vision — was he blind?

Dr. Shannon examined the eyes on June 26 and reported: "Pupils 3 mm., equal, round. No reaction to light. No apparent ocular palsies. Fundus, O. D. Disc is oval, axis is 90. The nasal margins are quite blurred and hazy. Temporal half appears pale. No hemorrhages, no exudates. Veins are somewhat distended. O. S. Same picture. Impression: Optic neuritis." (Shannon).

Blood Wassermann test reported negative.

At this time, June 26, the temperature ranged somewhat lower, from 101° to 104°.

A third spinal puncture showed fluid still clear.

Further X-ray studies of chest, made on June 24 and 27, failed to show evidence of lung abscess in the right lung. On June 27 the skull was rayed and report states that nothing was revealed to indicate intracranial disease change. The sphenoid sinuses were evenly dense and the cella turcica was within normal limits.

June 29: Cessation of discharge from right middle ear noted. The left ear continued discharging freely and signs of mastoid involvement appeared.

Blood examination on this date showed: Hemoglobin, 48 per cent; R.B.C., 3,400,000; W.B.C., 13,500; C.I., .70.

The temperature had dropped from a high of 103° on the twenty-eighth, to normal on the twenty-ninth. The pneumonia was subsiding, while the mastoid was becoming more severely involved.

July 1: Report on X-ray study of mastoids: "There is apparently no cellular structure in the left mastoid. The septae of the walls have been destroyed. The lateral sinus does not show clearly. The cells of the right mastoid are normal." (Farrell).

While the indications were quite sufficient for opening the mastoid at this time, it was deemed wise to allow the chest and general condition to improve before subjecting the patient to operation.

A W.B.C. made on July 6 showed a leukocytosis of 13,700.

The temperature having been practically normal for three days, I operated upon the left mastoid on July 9. At this time the child still lay motionless and apparently was unable to see. The lower limbs were rigid, the child made no attempt to move either leg and could not be made to sit up. He was unable to swallow and was being fed through a nasal tube. He made no attempt to speak. Because of the severe pneumonia from which the patient was not fully recovered, it was deemed unsafe to employ a general anesthetic. Operation was performed successfully under local anesthesia.

Two days after operation, the child began to notice the approach of doctors and nurses, would answer "yes" and "no" to questions and began to move the legs. Improvement from this time on was rapid and striking. A week later he was following the nurses about the ward, was eating normally in satisfying a ravenous appetite, and exhibited unusual mental brilliancy for a child of his years.

To summarize the interesting features in this case:

Lung abscess and intracranial infection were conditions first suspected.

Definite diagnosis of pneumonia not made until thirteen days after onset of illness.

Pneumonia complicated by bilateral suppurative otitis media, followed in turn by acute infection of the left mastoid.

Patient was in almost constant state of stupor for more than thirty days.

With the clearing up of the last focus of infection, in the mastoid, all neurologic phenomena promptly disappeared.

In closing I wish to thank Dr. Clerf and Dr. Bauer for permission to make use of the records in their respective departments.

1429 Spruce Street.

MENINGITIS.

Dr. George O. Cummings, Portland, Maine.

Between the years 1929 and 1933, thirty cases of meningitis were admitted to the wards of the Maine General Hospital. When the accompanying tabulation is studied, excluding three cases of meningococcus meningitis that recovered and one case of luetic meningitis that improved, the mortality is found to be 100 per cent. This naturally raises the question as to treatment and management.

Streptococcus, 8 cases; mortality, 100 per cent. Pneumococcus, 5 cases; mortality, 100 per cent. Staphylococcus, 1 case; mortality, 100 per cent. Influenza, 3 cases; mortality, 100 per cent. Tuberculosis, 6 cases; mortality, 100 per cent. Meningococcus, 6 cases; mortality, 50 per cent. Luetic, 1 case; improved.

The anatomical portal of entry for the infection was from the upper respiratory tract in the influenzal and meningococcic cases, from the chest in the tubercular cases, from the blood stream in the luetic case, unknown in the staphylococcic case, and in the streptococcic and pneumococcic groups from the middle ear or mastoid in seven instances, from the nasal sinuses in two instances, from fractures of the skull in two instances, one being through the ethmoidal region and one being through temporal bone, and in the remaining three instances unknown.

The following resume of the recent literature presents many of the high lights in the treatment and management of this condition:

THE TREATMENT AND MANAGEMENT OF MENINGITIS.

Meningitis is an inflammation of the meninges. The meninges consists of the thick fibrous dura, a protection against physical injury, the meshlike arachnoid a defense from bacterial invasion and chemical infiltration, and the film-like pia a limiting membrane. When the inflammation is limited to the dura mater the infection is called a pachymeningitis, when the pia-arachnoid is invaded it is called a leptomeningitis.

The brain is contained in an inelastic case, the skull. It contains spaces, the ventricles, that are filled with cerebrospinal fluid which

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communicate with the basilar cisterns, the arachnoid mesh and the cerebrospinal fluid spaces about the spinal cord. It is covered by the dura which lines the skull, forms the venous sinuses, the falx cerebri and cerebelli, and is continued into the spinal canal as the covering of the spinal cord. It mingles its fibers with the coverings of the nerves and blood-vessels as they leave the foramina of the cerebrospinal cavities. Between it and the delicate pia is the arachnoid whose spongy interstices are filled with cerebrospinal fluid and whose fibers follow those of the dura, attaching themselves to blood-vessels and nerves as they leave the skull and in addition following the blood-vessels as they enter the brain. The arachnoid forms lakes or cisterns on the cranial floor which communicate with the ventricles of the brain through the foramen of Magendie and the aperturae laterales and the spaces about the spinal cord. While the cerebrospinal fluid may flow from the ventricles to the arachnoid mesh, cisterns and pericordal spaces and vice versa, yet a distinct barrier exists between the arachno-cisternal spaces of the cerebrum and those of the cerebellum and cord.

The cerebrospinal fluid is secreted by the choroid plexus and is absorbed by the capillary network common to all tissues, in the arachnoid, by the lymphatics about the nerve sheaths at their exit from the skull, particularly about the olfactory nerves and possibly by the Pachionian bodies. The cerebrospinal fluid circulates slowly, but the mechanism of the circulation is unknown unless it is caused or aided by arterial pulsation and the respiratory ebb and flow of venous blood.

Meningitis occurs specifically in meningococcus meningitis and may arise in the course of any infectious disease, blood-stream infection, as the result of trauma plus infection or as an extension from nasal or aural disease. The characteristics of a particular meningitis depend upon the type of the offending organisms and upon their portal of entry.

When syphilis affects the meninges it largely limits its activities to the base of the brain with resulting cranial nerve disorders. Syphilis is a disease that progresses slowly and meningitis of syphilitic origin is insidious in onset and long in duration. It is sometimes helpful to think that the protracted syphilitic meningitis sets forth a slow moving picture of the fulminating meningitides caused by the pus producing organisms.

Tubercular meningitis may manifest itself either as a chronic slowly advancing infection or as an acute milliary process.

Meningococcic meningitis tends to be a self-limited disease affecting the posterior cisterns and the meninges of the spinal cord. Its course is neither as drawn out as the meningitides of syphilitic or tubercular origin nor as fulminating as those caused by the pus producing organisms, the staphylococcus, streptococcus, pneumococcus, etc.

Infection may reach the meninges by way of the blood stream, lymphatics and as the result of trauma. Certain localities are particularly vulnerable, notably the nasal and otic cavities and their adnexia, and nature has increased the arachnoid mesh internal to these structures in order to limit the extension of infection.

The olfactory nerves with investments of dura and arachnoid extend into the nasal cavity through the cribriform plate. They are protected by the nasa mucous membrane which is designed to combat infection. Operations on the middle turbinates, ethmoids and frontal sinuses may traumatize the tissue about the olfactory fissure and usually infection will not extend to the meninges unless virulent bacteria, new to the individual are introduced. If, however, the cribriform plate is injured a meningitis either occurs immediately or follows at a greater or lesser period a cerebrospinal rhinorrhea.*

Infection reaching the meninges by this route is introduced directly into a cisternal space and is fulminating. When, however, infection reaches the meninges through the cerebral walls of the frontal, ethmoid or sphenoid sinuses by way of the lymphatics, veins, by continuity of tissue or by operative trauma it tends to be localized by the arachnoid mesh and if adequate drainage is affected sufficiently early, meningitis may be prevented.†

Infection may reach the meninges as a result of disease or trauma of the temporal bone. It may extend by continuity of tissue or by osteothrombosis from disease of the mastoid or petrous pyramid, from lateral venous sinus phlebitis or thrombosis or from infection in the labyrinth by way of the ductus endolymphaticus or internal auditory meatus. Fractures at the base of the skull may open pathways for infection. While the dura may be exposed with com-

*The production of this condition is interesting. When the cribriform plate is fractured and a leakage of cerebrospinal fluid occurs the mucous membrane of the nose, a more primitive and faster growing tissue than the endothelium of the meninges, extends through the perforation and forms an epithelialized sinus through which infection sooner or later gains entry.1

†"Meningitis occurs in only about 8 per cent of untreated cases of fracture of the temporal bone through the dura, but in nearly 25 per cent of the untreated cases of fracture through the accessory sinuses in which the dura is perforated. This is because of the difference in the physiological structure of the two overlying regions, one being constructed to resist infection and the other trauma."2

parative impunity by operation, if it is torn or traumatized, meningitis is more than apt to follow.

The arachnoid in the region of the mastoid, lateral sinus, ductus endolymphaticus and internal auditory meatus tends to localize infection. When, however, it overleaps these barriers it invades the lateral arm of the lateral cistern and a diffuse meningitis results. If meningitis follows infection of the petrous pyramid it has entered directly into the pontine cistern and a diffuse meningitis results.

Meningitis may arise from infection about the upper lip or cheeks, either ascending the lymphatics or by subsequent phlebitis or thrombosis of the facial veins involving the cavernous sinus. Infection may also follow the great vessels of the neck.

The frequency of the occurence of meningitis due to various bacteria is well shown by a study by Neal[3] of 1523 cases of meningitis in New York City during the years from 1910 to 1924. He found 662 to be of tubercular origin, 625 to have been caused by the meningococcus, 86 by the pneumococcus, 83 by the streptococcus and 51 by the influenza bacillus.

The mortality in meningitis caused by the pus producing organisms is set forth in the subsequent data. Kolmer[4] states that there is an almost 100 per cent mortality in meningitis due to the pneumococcus and streptococcus. Yerger[5] reviewing the statistics of the Cooke County Hospital for a ten year period found reported 63 cases of otitic origin with 2 recoveries. Meningitis of influenzal origin also shows a high mortality. Rivers[6] in a series of 220 such cases found 17 recoveries. Bloom[7] in a series of 302 cases reported 24 recoveries. Rivers,[6] Neal,[8] and Jenks and Radbill[9] in three different groups of consecutive cases found two recoveries in 87 cases.

When meningitis exists but organisms are not found in the spinal fluid the mortality is less. Mygind[10] reported a series of 210 cases of otitic meningitis with 59 recoveries, but it is interesting to note that in only 10 per cent of the cases that recovered were bacteria recovered from the spinal fluid. Young and Bennett[11] report the recovery of six cases of purulent meningitis arising from suppurative foci in the head in which no bacteria were found in the spinal fluid. Kolmer[4] observes that signs of meningitis may occur in the course of a lobar pneumonia with a sterile spinal fluid and recovery is the rule and that even if bacteria are found in such cases recovery is apt to be more certain than if the meningitis was secondary to infection in the sinuses or mastoids.

Many methods of treatment have been suggested and these may be divided into various groups. It is generally agreed, however, that whatever the subsequent treatment, any suppurative focus should be drained or removed. Drainage of the cerebrospinal fluid is the sheet anchor of treatment. This has been accomplished by spinal, cisternal and ventricular puncture, by laminectomy, multiple incisions through the dura and by drainage of the labyrinth. The cerebrospinal fluid spaces have been flushed with normal saline, Ringer's solution and antiseptics. The flow of fluids toward or away from the central nervous system has been influenced by the administration of hypo- or hypertonic solutions given intravenously and otherwise. Drugs and sera have been introduced by spinal, cisternal and ventricular puncture, by intravenous and intracarotid injection. The carotid has been tied to put the affected side of the brain at rest.

The high mortality in meningitis caused by the pus producing organisms has been remarked. The following tabulation by Ersner and Mendell[12] of the studies of Rosenberg and Notley[13] in 1931 and Appelbaum[14] in 1932 of the various types of treatment used to effect a cure in known cases of streptococcic meningitis graphically portrays the diversity of methods of treatment.

METHODS USED TO EFFECT CURE.

Mastoidectomy, 6; mastoidectomy and lumbar taps, 7; lumbar taps alone, 8; lumbar taps and streptococcic serum, 2; anti-streptococcic serum alone, 4; dural drainage, 2; laminectomy, 3; mastoidectomy and labyrinthectomy, 1; lumbar taps and jugular ligation, 1; surgical drainage, 2; lumbar taps and anti-meningococcic serum, 3; anti-meningococcic serum alone, 2; lumbar taps, chemicals intravenously and intraspinally, 3; mastoidectomy, cisternal taps, chemicals, anti-streptococcic serum, 1.

To this list Ersner and Mendell add two recoveries in cases of streptococcus meningitis treated by the intracarotid method with anti-streptococcic serum, repeated lumbar taps, blood transfusions and dehydration.

Kolmer reports the recovery of one case of pneumococcus meningitis following intracarotid medication with Felton's serum with optochin hydrochloride. He also reports the recovery of a case of staphylococcus meningitis treated with Pregl's solution by the intracarotid route.

THE CEREBROSPINAL FLUID.

The physical findings in a case of meningitis rarely leave the diagnosis in doubt. It remains, however, for the examination of the

SUMMARY OF THE USUAL CEREBROSPINAL FLUID CHANGES IN DISEASE.

(Kolmer and Boerner, Approved Laboratory Technique, D. Appleton & Co., 1931.)

Disease	*Pressure*	*Type*	*Coag.*	*Cells*	*Qual. Glob.*	*Qual. Alb.*	*Quant. Prot.*	*Quant. Sugar*	*Chlor.*	*Bact.*	*Wass.*	*Gold*
Normal	100-200	Clear	0	0-10 lymph.	0	0	15-40	50-60	720-750	0	Neg.	Neg.
Serous Meningitis	Increased	Clear	0	Norm.	0	0	Norm.-slt. incr.	Norm.	Norm.	0	Neg.	Neg.
Purulent Meningitis	Marked increase	Cloudy	Coag.	100-5000 poly.	4x	4x	Incr.	0-60	Norm. or incr.	x	Neg.	Meningitic curve
Chr. Bas. Meningitis	Normal or Increased	Clear or opalesc.	Coag.	10-1000 poly.	4x	4x	100-1000	20-60	Norm.	0 or meningo coc.	Neg.	Meningitic curve
Tubercular Meningitis	Increased	Clear	Fibrin Web	80-1000 lymph.	2x-4x	2x-4x	100-1000	0-40	500-700	T.B.	Neg.	Meningitic curve
Syphilis Meningo-Vas.	Normal or clear	Clear	0	2-1000 60% lymph.	1x-2x	2x-3x	30-150	Norm. or less	Norm.	0	Pos.	Luetic Zone II
Ant. Polio-myelitis	Increased	Clear or opalesc.	Fibrin Web	0-2000 early poly. later lymph.	x	2x	40-500	40-120	Norm.	0	Neg.	Meningitic or Zone II
Epidemic Encepha-litis	Normal or increased	Clear	Fibrin occ.	10-200 lymph.	1x-0x	1x-2x	30-200	40-120	Norm.	0	Neg.	

spinal fluid to determine the variety of the meningeal disease and the type of the offending organisms. Kolmer[4] remarks that he has never seen any harm following spinal puncture and the slow withdrawal of about 5 cc. of cerebrospinal fluid for diagnostic purposes. The accompanying chart gives a summary of the usual cerebrospinal fluid changes in disease.

CEREBROSPINAL FLUID PRESSURE.

Ayer[16] considers that in recumbent position using a water manometer the normal range of cerebrospinal fluid pressure is between 100 and 200 mm., that pressures from 200 to 250 mm. are suspiciously high and that pressures from 250 to 300 mm. may probably always be explained on the basis of intercranial pathology. Cerebrospinal fluid pressures are very nearly doubled when the readings are taken with the patient in a sitting position and, whatever the position, are increased by coughing, crying, etc. The method of estimating the cerebrospinal fluid pressure by counting the drops from the needle is unreliable.

SPECIFIC PROPHYLAXIS OF PNEUMOCOCCUS AND STREPTOCOCCUS MENINGITIS WITH VACCINE.

Kolmer and Amano[17] state that it is possible to raise the resistance of rabbits to meningeal infection with virulent pneumococci and streptococci by preliminary immunization with autogenous vaccines. They suggest that preliminary to operation on mastoids or sinuses, when there is a possibility of meningitis a careful examination of the secretions should be made and if pneumococci or streptococci are found, autogenous vaccines should be made and administered if time permits. At least six or eight doses, increasing 0.2 cc. per subcutaneous dose, of an autogenous vaccine containing 1,000,000,000 per cc. should be given at intervals of four or seven days and the operation postponed until a week after the last dose.

SERUM PROPHYLAXIS.

Kolmer[4] suggests that if the possibility of a meningitis be suspected a proper serum be administered before or after an operative procedure provided that the offending organisms can be determined. He recommends that when Type I pneumococcus is found that 10 cc. of Felton's concentrated antipneumococcic serum be injected intramuscularly, a second dose may be given the next day and the third dose four days later. When the infection is caused by Type II or

Group IV pneumococci, 15 cc. should be used and when Type III is the offender, 20 cc. of serum should be employed. One-half doses should be used in children under ten years. He also urges the administration of ethylhydrochlorid in 5 gr. doses in milk every five hours. When the streptococcus is the invading organism he feels that polyvalent antistreptococcic serum should be given intramuscularly, repeated the following day and again in four days.

SPINAL PUNCTURE.

Spinal puncture is a comparatively safe and simple procedure. Therapeutically it provides drainage. Manometer readings record intercranial pressure. Laboratory examination of the cerebrospinal fluid obtained reveals the type and progress of the infection. It is the fundamental procedure in the treatment and management of any meningitis. Spinal punctures should be performed at eight hour intervals and sufficient fluid should be withdrawn to allow the pressure to drop to normal or slightly below.

Certain mild meningitides in which spinal puncture has been performed early with relief of symptoms may be cured by repeated spinal punctures. If, however, the symptoms become aggravated and the laboratory reports signs of increasing meningeal irritation, some other type of treatment should be considered. Young and Bennett have recently reported a group of six cases of aseptic purulent meningitis cured by this means alone. Bowers,[18] Weaver,[19] Huenekins and Stresser,[20], Needles[21] and others have reported cures resulting from spinal taps in cases of meningitis in which streptococci and influenza bacilli have been found in the spinal fluid.

Continuous drainage has been arranged by supporting the patient on a Bradford frame after the spinal puncture needle was introduced.

CISTERNAL PUNCTURE.

Cisternal puncture is a more formidable procedure than spinal puncture. It has the advantage over spinal puncture in that it more directly drains the diseased areas.

The technic for cisternal puncture is as follows: The patient may be placed in either the sitting or recumbent position. The occipital region is shaved and the skin is sterilized with tincture of iodine. A few drops of novocain are introduced as a local anesthetic. The operator's thumb is placed over the spine of the axis and a spinal puncture needle is introduced above it in midline in the direction of

a line drawn from the external auditory meatus to the glabella. The dura usually lies at a depth of 4 to 5 cm. from the skin surface. It is inadvisable to insert the needle to a greater depth than 6 cm. Centimeters may be indicated on the needle by file marks.

THE INTRODUCTION OF SERUM INTO THE CEREBROSPINAL FLUID SPACES.

The introduction of specific or nonspecific sera into the cerebrospinal fluid spaces by spinal or cisternal puncture has been carried out in many types of meningitis. After a thorough drainage of the cerebrospinal fluid, from 10 to 20 cc. of serum is slowly injected. These injections should be repeated every 8 or 12 hours until bacteria are no longer found in stained smears of the cerebrospinal fluid or until the patient has made a definite recovery. This type of therapy finds its most successful use in meningococcus meningitis in which the death rate has been reduced from 75 per cent to 30 per cent.[22] The administration of convalescent serum intraspinally in anterior poliomyelitis has proved its worth. Kolmer[23] believes that the intraspinal introduction of anti-influenzal serum is of value in influenzal meningitis and suggests that its efficacy may be reinforced by intramuscular injections. This method of medication has not found as much success in the treatment of meningitis of streptococcic or pneumococcic origin, but anti-scarletinal rather than the polyvalent serum is favored for streptococcus meningitis and Kolmer[4] suggests the use of a mixture of 25 cc. of Felton's anti-pneumococcic serum with 1 cc. of a 1-100 solution of ethylhydrocuprein hydrochloride in a sterile physiological salt solution of sodium chloride or water.

Vibber and Tartakoff[24] have suggested injecting from 7 to 8 cc. of air along with the serum, feeling that the bubble of air conveys the serum to the areas of the meninges most in need of treatment. Following this procedure the head and foot of the bed are alternately raised and lowered 12 inches at one minute intervals for 10 times, the patient is then left for a period of time with the foot of the bed elevated with two pillows under his head and later the position is reversed, with the intent of thoroughly mixing the medication and the cerebrospinal fluid and carrying the air by gravity to all parts of the cerebrospinal fluid spaces.

THE INTRODUCTION OF DRUGS INTO THE CEREBROSPINAL FLUID SPACES.

The introduction of drugs into the cerebrospinal fluid spaces has not met with brilliant results. Many drugs have been used and com-

ment will be made on the following: M'Kinley and Holden[25] state that even a small amount of mercurochrome introduced intrathecally will produce convulsions and death. Eagleton draws the following conclusions concerning the use of sodium glycolate:

"*1.* Sodium glycolate in 1 per cent solution causes a lysis of pneumococci because 1 per cent sodium glycolate can be injected into the spine of a normal rabbit and will not kill him. When injected intravenously in a normal rabbit, the rabbit lives, but when injected intravenously in a rabbit with a pneumococcic infection, the rabbit soon dies.

"*2.* If sodium glycolate is to be used at all, a strength of not more than 1/20 of 1 per cent should be employed at first. Rosenburg and Nottley[13] report a recovery in a case of streptococcic meningitis following repeated spinal punctures and spinal canal irrigations with a 1-4000 aqueous solution of neutral acriflavine coupled with antistreptococcus serum injections."

LAVAGE OF THE CEREBROSPINAL FLUID SPACES.

Eagleton[1] states that lavage of the cerebrospinal fluid spaces is not admissible unless it is felt that the meningitis is general. He remarks that temperature or chemical changes induced by irrigation produce profound reactions.

Kolmer[4] found that ventriculo-cisternal spinal lavage with warm Ringer's solution was of value in the treatment of experimentally produced pneumococcus Type I and streptococcus hemolyticus meningitis. He reported that such injection of immune serum alone failed to save any of the animals and is of the opinion that ventriculo-cisternal spinal lavage might be of value in humans if they came under treatment sufficiently early.

INCISIONS IN THE DURA.

If a diagnosis of a localized meningitis can be made, an incision through the dura should drain the infection and relieve the condition.

Hempsted[26] remarks that in the presence of a meningismus or an early meningitis, adequate surgery should be performed on an infected mastoid, lateral venous sinus, labyrinth or sinus and that wide incisions should be made through the dura.

Spurling[27] in eight cases of meningitis performed laminectomies and instituted continuous drainage of the spinal fluid, with recoveries in five instances. His procedure is as follows:

1. The lamina of the second lumbar vertebra is removed

2. The dura mater is incised longitudinally for about an inch and the subarachnoid space entered.

3. A small gutta percha tissue drain is placed among the filaments of the cauda equina and sutured to the cut edge of the dura mater with a single black silk stitch.

4. The operative wound is closed loosely in layers.

5. Fluid intake should be kept as high as possible—not lower than 5000 cc. per twenty-four hours. Fluids may be given by mouth, hypodermically, by rectum, intravenously or intraperitoneally.

6. The dressing on the wound should be changed every four hours (oftener if necessary) and strictest aseptic precautions observed.

7. Patient should be kept in a semi-recumbent position and may be changed from side to side as often as desired.

8. Drain should not be removed until meningeal symptoms have entirely subsided. Usually it will extrude itself about the tenth day.

9. The wound closes spontaneously in from two to three weeks. Haynes,[28] Dandy,[29] Sharpe[30] and others have favored continuous drainage.

Kerrison[31] has recently advocated continuous drainage through multiple dural incisions in the region of the Sylvian fissure in order to drain the basal cisterns, the obliteration of the lateral venous sinus with similar incisions above and below the tentorium, thus draining the supra- and sub-tentorial basins and further incisions in the region of the vertical portion of the lateral sinus, thereby draining the cisterns about the sigmoid and the cisterna pontis. He believes that the resulting cerebrospinal fluid drainage arising from these procedures will be accelerated by the institution of the forced drainage of Kubie.

Eagleton believes that continuous drainage is irrational.

FORCED CEREBROSPINAL FLUID DRAINAGE.*

Kubie[32] believes that since the cerebrospinal fluid reaches the cerebrospinal fluid spaces by dialysis, that if the salinity of the blood was decreased by the intravenous injections of hypotonic solutions that the flow toward the cerebrospinal fluid spaces would be accelerated and if continuous cerebrospinal fluid drainage was established,

*Since this resumé was submitted for publication a comprehensive article, "Forced Drainage of the Cerebrospinal Fluid," by Kubie, L. S., and Retan, G. M., has appeared in the Jour. A. M. A., 101:354, July 29, 1933, and should be studied by anyone attempting this form of therapy.

the flow from the blood through the secreting tissues and the cerebrospinal spaces would be even more increased with the resulting flushing of these spaces and the deposition of cellular elements of defense in the tissues.

Since the intraspinal pressure rises after the administration of large amounts of hypotonic solutions, the "forced drainage" method should not be undertaken unless continuous drainage of the cerebrospinal fluid has been instituted. The intravenous injection of a hypotonic saline solution of about 0.45 per cent will secure the quickest response. Such solutions may be given safely provided they are given slowly. The flow of 3 cc. a minute is safe. Fluids may also be given by mouth, subcutaneously and by rectum.

DECREASING THE BRAIN BULK BY ADMINISTERING HYPERTONIC SOLUTIONS.

Conversely the cerebrospinal fluid pressure and the brain bulk may be diminished by the intravenous administration of hypertonic solutions. Practically this may be accomplished by the repeated intravenous injection of a concentrated glucose solution, the restriction of fluid intake and by giving ½ ounce doses of a saturated solution of magnesium sulphate repeatedly by mouth.

Ersner and Mendell[12] note the use of this form of therapy in the successful intracarotid treatment of two cases of streptococcus meningitis. They further remark that in a case that they considered out of danger, some forty days after operation headache, vomiting and a left homonymous hemianopia developed. The patient was then on a full diet. Immediate limitation of fluids and the administration of concentrated glucose solution intravenously caused the entire syndrome of increased intracranial pressure to disappear.

INTRACAROTID MEDICATION.

The hypothesis upon which the intracarotid method of treatment advocated by Kolmer[15, 23] rests is: first, that infection exists in the tissues of the meninges as well as upon the surfaces of the cerebrospinal fluid spaces and second that medication introduced through the carotid arteries will be filtered through these tissues into the cerebrospinal fluid.

Kolmer[15] suggests: "For Type I pneumococcus meningitis, the injection of 10 cc. of Felton's concentrated anti-pneumococcus serum, reinforced with 0.5 cc. of 1:100 optochin hydrochlorid into each

common carotid artery. Immediately afterward, a cisternal puncture should be made with thorough spinal drainage of fluid and the slow intracisternal injection of from 3. to 5 cc. of the mixture. Or if cisternal puncture cannot be done, a thorough spinal drainage be made, followed by the intraspinal injection of from 10 to 20 cc. of the serum-optochin mixture. Six hours later another spinal drainage may be made, followed by additional drainages every six hours while the intake of fluid is pushed to 4 or 5 liters a day for adults and children in proportion. This covers the treatment for 24 hours and should be repeated daily for at least two to five or more days, regardless of the clinical improvement of the patient."

In infection with Type II pneumococcus the dosage is raised to 15 cc., in Type III pneumococcus to 20 cc., while in Group IV infections, 10 cc. is suggested.

In streptococcic meningitis the same procedure is followed except that 10 cc. of scarlet fever antitoxin or concentrated antistreptococcus serum is mixed with 10 cc. of Pregl's solution. If serum cannot be employed, 10 cc. of a 0.5 per cent solution of neutral acriflavin or 10 cc. of concentrated Pregl's solution may be used.

In staphylococcus meningitis, Pregl's solution or neutral acriflavin may be used.

Intracarotid injection may be accomplished without cutting down upon the artery by the following method described by Hirsch, Myerson and Halloran[34] — a 19, 20 or 21 gauge needle, attached to a syringe, pierces the skin perpendicularly at the anterior edge of the sternomastoid muscle, near the upper edge of the omohyoid and just below the border of the thyroid cartilage. Resistance is encountered when the carotid sheath is reached. When the lumen of the artery is entered blood pulsates in the syringe.

The simplest manner of making the injection is to expose the carotid artery by an incision. This may be accomplished under local or general anesthesis. A narrow strip of vaseline gauze tape is left about the artery as a guide ligature. The needle enters the blood-vessel obliquely and the injection is made slowly. The wound is packed with vaseline gauze. To prevent the plunger from sticking, it is well to flush the syringe with normal saline before filling it with the serum.

Ersner and Mendell[12] suggests that the external carotid artery be blocked while the injection is being made by lifting it with a strip

of vaseline gauze tape if it is desired that the greater amount of the injected fluid go to the middle and posterior cranial fossae, and to leave it unblocked if a greater portion of it be desired in the anterior fossa.*

Ersner and Mendell[12] have noted staining of the spinal fluid a deep yellow when neutral acriflavin has been administered by the intracarotid route.

CAROTID LIGATION.

Eagleton[1] believes that ligation of the common carotid artery on the affected side will put that side of the brain at rest and reduce intracranial pressure.

POTASSIUM PERMANGANATE TREATMENT FOR PNEUMOCOCCUS MENINGITIS.

Weinberg[35] reports the recovery of a case of Type III pneumococcus meningitis from the following treatment: Following a cleansing enema, a retention enema of 2 grains of potassium permanganate to 1½ pints of water is introduced and the patient is instructed to lie on his left side for at least 20 minutes to facilitate retention. These enemas are repeated at four hour intervals if necessary. The potassium permanganate is dissolved in cold water in a glass dish, after which a sufficient amount of warm water is added to bring the solution up to body temperature. Nott[36] has also reported a recovery from similar treatment.

BLOOD TRANSFUSIONS.

When the meningitis arises from a blood stream infection, repeated small transfusions may increase the patient's resistance.

Eagleton has suggested that repeated small transfusions from an immunized donor followed by massive lumbar punctures should favor the transudation of immunizing substances into the cerebrospinal fluid.

CONCLUSIONS.

1. All authorities agree that the earlier treatment is instituted after a diagnosis of meningitis is made the greater the chance of recovery.

*The attention of the reader is called to an article, "Intracarotid Treatment of Meningitis and Changes Noted in the Carotids Following Intracarotid Therapy. Measures to Prevent These Changes," by Ersner, M. S., and Myers, D., The Laryngoscope, 43:630, Aug., 1933, which appeared after this resumé was submitted for publication.

2. The possibility of protecting a patient about to be operated on for a chronic nasal or aural disease from meningitis by the use of streptococcus or pneumococcus vaccines should be borne in mind.

3. The administration of antistreptococcus or antipneumococcus serum immediately before or after an operation for a condition that may give rise to meningitis should be considered.

4. Spinal puncture should be performed at eight-hour intervals until the patient is well on the road to recovery, another type of treatment is instituted or death ensues.

5. Cisternal punctures may be used alone or in conjunction with spinal punctures for similar purposes.

6. The introduction of serum into the cerebrospinal fluid spaces has been of particular value in meningococcus meningitis, of some value in influenzal meningitis and of less value in meningitis of streptococcic or pneumococcic origin.

7. The introduction of drugs into the cerebrospinal fluid spaces has not met with brilliant results.

8. Lavage of the cerebrospinal fluid spaces has not met with satisfactory results in human beings.

9. Dural incisions: *A.* Infective foci should be removed or drained. *B.* The dura should be incised if a localized meningitis exists. *C.* Laminectomy for continuous drainage should be strongly considered. *D.* Extensive cranial operations do not seem logical.

10. Forced cerebrospinal fluid drainage by forced fluid intake plus the intravenous introduction of hypotonic salt solution should be of definite value as an adjuvant to other types of treatment dependent upon continuous cerebrospinal fluid drainage.

11. Decreasing the brain bulk by intravenous introduction of hypertonic solutions, restriction of fluid intake and the administration of magnesium sulphate may prove of worth.

12. Intracarotid medication is the only means available of sending relatively concentrated chemicals or sera through the infected secreting membranes into the cerebrospinal fluid. It is applicable in all types of meningitis and may be used in conjunction with other therapeutic measures.

13. Carotid ligation may be of value if the meningitis is confined to one side and the focus of the infection can be drained or removed.

14. Potassium permanganate treatment for pneumococcus meningitis demands consideration.

15. Transfusions to increase the resistance of the patient in meningitis of blood-borne origin is of importance.

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47 Deering Street.

PLASTIC SURGERY OF THE SADDLE NOSE.*

DR. MICHAEL M. WOLFE, Philadelphia.

The reconstruction of the saddle nose has been a challenge to the plastic surgeon for centuries.

In reviewing the literature, one is struck by the diversity of opinions regarding the various materials employed. Grafts from the same individual (autografts) are employed; tissues from other individuals (isografts) were used; and not infrequently substances from lower forms of animal life (zoografts) were moulded to fill in the defect. Gold plates, silver plates, alloys, celluloid and other inorganic supports have been used with varying success.

Bone grafts were frequently employed in the reconstruction of the saddle nose. In order to retain its vitality, the bone graft must be in apposition with bone both proximally and distally. Since it can only be attached at the root of the nose, the distal end, to which there is no bony attachment, soon degenerates. This occurs whether the periosteum is intact or has been removed. Absorption eventually takes place, which distorts the nasal contour. Moreover, bone grafts are not only highly susceptible to infection, but improper handling reduces their vitality and, in addition, are difficult to shape accurately. The above comments are equally applicable when bone and cartilage are employed as one piece.

Charles Nélaton (about 1900) was the first to use rib cartilage in plastic repair of the saddle nose. Many rhinologists and general and oral surgeons still employ cartilage for this plastic repair. Its source is from the area along the seventh, eighth and ninth ribs, preferably the right side, in order to avoid the cardiac structures. In this location, a wide plaque may be removed and then modeled to the desired size and shape. After removal of the cartilage, closure of the chest wound is accomplished by the assistant. The chest wall is immobilized with wide adhesive by the same method as in the case of a fractured rib; otherwise the pain in this area would

*Read before the Clinical Staff of the American Stomach Hospital, Philadelphia, May 9, 1933.

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be intense. During the closure of the above wound by the assistant, the surgeon is engaged in shaping the cartilage. Some remove the perichondrium; others allow the perichondrium to remain, and some permit only a small portion to be intact if an angulation is desired and for suturing at the philtrum. Cartilage depends upon lymph for nourishment and, according to some observers, it probably grows when the perichondrium is intact. Despite the fact that cartilage is probably the most widely used transplant material for the correction of the saddle nose, it has disadvantages. In the first place, a double operation must be performed, as in the case of a bone transplant, to which many patients object. Cartilage is difficult to handle, cannot be accurately shaped to any pattern, has a marked tendency to curl, is easily infected and does not combat infection, and in many instances is either partially or completely absorbed.

Tieck, in 1918, was the first to employ the middle turbinate bone for the correction of the saddle nose. He states: "The bone is removed with extreme gentleness. Should the future transplant be injured or crushed in its removal, not only will it offer resistance to re-establishment of the circulation and so become necrotic, but it will be also of less value when filling the depression."

H. Lyons Hunt, who has had a very wide experience, I quote as follows: "In my work in constructive surgery of the nose I have used sections from ribs, costal cartilages, the sternum and tibia with only a fair degree of success. In cases of cartilage transplantation, the transplant is usually absorbed—the cartilage, being nonvascular (dependent entirely for its nourishment on the perichondrium) is apparently without sufficient vital resistance. I had a few cases in which transplanted cartilage did not suppurate, and the nose still retained its shape; but such cases are so insufficient numerically in comparison to the unfortunate cases of absorption that their rarity only makes more precious their lesson. In those cases in which I have used sections from the tibia, sternum and rib, excluding the occasional serious osseous complications which sometimes occur from the removal of bone in these localities, I have found the compact outer plate too dense and hard to mould properly, and the graft often does not take, apparently rapidly losing its vitality."

Gillies and others state: "Bone with or without its periosteum is to be discarded, as many times it is slowly absorbed; furthermore, it is difficult to shape, and this leads to unnecessary handling of the graft, which may cause infection."

Some of the inorganic substances, such as gold, silver and celluloid, have been used as implants with success in some instances. These materials may give an excellent result immediately following the operation, although the future is always uncertain. These inorganic materials are so vastly different in their constituents as compared to human tissues that sooner or later they are ejected as a foreign body. They have long since been relegated to the scrap heap of modern plastic surgery. The popularity of zoografting has waned. Among the tissues employed were those obtained from rabbits, pigeons, frogs, cats, soup bones, etc. Paraffin has frequently been employed in the correction of this deformity. It is mentioned only to be condemned, as it is not only of temporary benefit, but

Fig. 1A. Fig. 1B.

Fig. 1A. Severe saddle deformity due to trauma. This case required a preliminary submucous resection.

Fig. 1B. The postoperative result of an ivory implant.

may produce any type of pathological process, from a simple inflammation to cancerous degeneration. In addition, when paraffin becomes soft it is capable of producing the most grotesque and hideous deformity.

In 1913, Eitner carried out experiments with various alloplastic materials, especially ivory, and in 1915 reported a large number of saddle noses corrected with ivory. Eitner states: "While implantations of cartilage always showed considerable contraction and while even pieces of bone were subjected to partial resorption, the ivory remained unchanged."

Several years later (1918) Joseph, of Berlin, reported most favorable results with the use of ivory in the reconstruction of the

saddle nose. Likewise, other authors, such as Gandela, König, Pasqual de Juan and Safian, have, from their experiences, affirmed the superiority of ivory for this cosmetic correction.

Clinical experiences over a period of years has definitely established the fact that animal ivory (elephant) is the ideal implant for saddle nose correction. It is an organic substance whose chemical composition is similar to human bone. This accounts for its nonirritating effect on the surrounding structures, and therefore it is not expelled as a foreign body. Before any material can merit the distinction of being referred to as an ideal implant, it must necessarily measure up to certain prerequisites:

Fig. 2A. Fig. 2B.

Fig. 2A. Low saddle deformity. Produced by continuous traumatism incidental to his short pugilistic career.

Fig. 2B. After a two-stage plastic correction. First stage consisted of narrowing the nasal bridge, reconstruction of tip with slight shortening. Second stage; ivory implant only.

1. The material must be easily procured, ready for use at all times and without any special preparation.

2. It must be of such consistency as to be easily shaped or carved to suit various types of saddle deformities.

3. It must be well tolerated by the tissues and retained in position.

4. It must not change its shape nor be absorbed.

5. It should resist infection.

Clinical experience has conclusively demonstrated that animal ivory possesses these qualifications. Several authors have reported

the removal of ivory implant from one to seventeen years old, which were exchanged for various reasons. These implants upon removal showed no visible transformation; some presented tiny superficial erosions which did not impair their shape. Ivory can be accurately shaped to fill in the defect with such precision that the plastic surgeon has a vivid picture of the end-results. In fact, the ivory may be so carved as to completely harmonize with the facial features and stature of the individual.

Before implanting the properly carved ivory, other nasal corrections are first accomplished. The mere transplant is not sufficient in producing a good cosmetic result. Many of these individuals have a broad, flat nose, so that a two-stage operation is indicated. The first stage consists of narrowing the bridge of the nose in which the nasal bones are severed, resulting in a relatively higher appearance to the nose, so that when the implant is inserted a better shaped nose will result. If the nares are of negroid type, they may be corrected at this time. All other corrections are completed at the first stage of the operation. About six to eight weeks elapse before the second stage is attempted. This consists only of inserting the implant. All nasal operations are accomplished through the inside of the nose, so that no scars are visible. The correction of deformities of the bony or cartilaginous parts of the nose must not be attempted before the age of eighteen, when these structures have reached their full development. Intranasal infection, of course, is an absolute contraindication for any cosmetic operative procedure.

The technique of the operation is not difficult but demands attention to details. As in all surgical procedures, asepsis receives its due consideration. Cleansing the nose and face is accomplished by any of the well known methods. The face is draped, exposing the nose as far up as the glabella and down to and including the upper lip. Novocaine, 1 per cent, is employed throughout. The injections are made through the nasal vestibule to the sides and dorsum of the nose. It is surprising how little of the anesthetic is required. Too much infiltration modifies the nasal contour, increases postoperative swelling and, according to some observers, reduces the vitality of the structures so treated.

The incision is made within the left vestibule (for a right-handed operator) at the inferior border of the triangular cartilage (see Fig. 3). The length of the incision depends upon the size of the implant to be inserted. Sufficient skin overlying the dorsum and lateral walls are separated by blunt dissection and with the Joseph

comma knife. The separation must not be too wide, but just enough to produce a pocket for the reception of the ivory.

As a general rule there is very little bleeding from this dermal separation.

The implant is introduced and adjusted into its proper position. The skin overlying the implant must not be on a stretch as any tension may alter the nutritional supply of the dorsal skin and defeat the operation. Several strips of adhesive are placed over the dorsum of the nose, which assists in retaining the ivory in its proper position. A small piece of gauze is placed in the left nostril, which completes the operation. No sutures are employed.

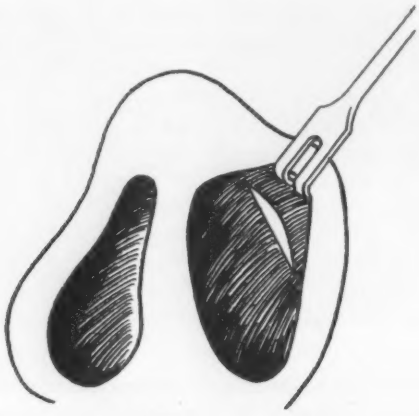

Fig. 3.

The patient should remain in bed for three days and as quiet as possible, so as not to dislodge the implant. The tiny piece of gauze in the left nostril is changed daily. The adhesive over the nose remains untouched for three days, after which time it is removed and no further external dressings or applications are necessary. After the third day the implant is fairly well held in position by the overlying skin, which has contracted, and by the snug fit of the ivory to the dorsum of the nose. Pain is entirely absent as a post-operative symptom. A transient swelling is noted over the dorsum of the nose, which quickly subsides on account of its mild character. Within a short space of time, the ivory becomes surrounded by a firm fibrous capsule and though slightly movable, it cannot be dis-

lodged. If the ivory has been retained beyond the first week, it will generally remain *in situ* indefinitely.

Primary infection, when it does occur, manifests itself about the third day; the symptoms of which are identical with local infection, plus headache. This demands immediate removal of the implant with drainage via the original incision. After complete regeneration, the implant may be reinserted after a lapse of several months. I have seen two such cases of local infection without any permanent damage in which the implants were retained at a subsequent operation. Fortunately, they were not my cases.

The following cases will serve to illustrate the importance of attention to details: In the first case, about a week following the ivory implant, instead of the skin contracting over the dorsum of the nose, there appeared a noninflammatory swelling. In the course of the following week, the ivory could easily be pushed from side to side, as if it were enveloped in some liquid. I saw the patient with his physician, who had inserted the implant and suggested its immediate removal. It proved to be true ivory but was not sufficiently smooth. Several months later, the corrected smooth implant was reinserted and has since remained in place, a lapse of two years. Any sharp or rough edge or a ridge on the under-surface not sufficiently smooth is apt to produce a slight irritation, which is capable of producing a serous exudate. This serous exudate was present in the case referred to above. Had the condition been permitted to go on, undoubtedly the ivory would have been expelled. In another case, a similar experience, but to a lesser degree, was present. In this instance, however, the ivory was carefully carved and smooth on all surfaces, but by test proved to be vegetable ivory and not true animal ivory. The implant was removed. After a lapse of several months true ivory was reinserted and has remained in place. If the patient is in apparently good health, the nasal orifices free from infection, asepsis rigidly observed, properly carved elephant ivory employed, and with a good technique, one should have no hesitancy in using this method which at present seems to be the ideal procedure for the correction of saddle nose deformities.

SUMMARY.

Animal ivory is the ideal implant for the correction of saddle deformities of the nose for the following reasons:

1. It is non-absorbable.
2. It is exceedingly well tolerated by the surrounding tissues.

3. It is easily sterilized by boiling.

4. On account of its strength and compactness it will hold its original shape. In a great many instances bone or cartilage is absorbed and the latter has a tendency to curl in the direction of the perichondrium. This curling will occur whether the perichondrium has been removed or not.

5. Ivory is carved accurately before the operation.

6. There is only a transient swelling of the overlying skin when ivory is employed, and pain is entirely absent as a postoperative symptom.

7. The insertion of the ivory implant is a relatively simple procedure and quickly accomplished, which is very gratifying to the patient.

8. The various organic and inorganic substances used are often ejected as a foreign substance by the host. This rarely occurs with ivory.

9. Ivory does not provoke infection.

10. Ivory becomes encapsulated by fibrous tissue, which may be demonstrated by roentgenograms and by implants that have been exchanged for various reasons.

11. The cosmetic results when ivory is employed are superior to those obtained by any other implant. A pleasing appearance of a permanent nature is the ideal of plastic surgery.

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1930 Chestnut Street.

THE VALUE OF BONE AND CARTILAGE GRAFTS IN RHINOPLASTY.*

DR. WILLIAM WESLEY CARTER, New York.

Autogenous bone and cartilage grafts have supplanted all other substances in reparative procedures, not only in the nose, but in other parts of the body where rigidity or resiliency are important considerations.

The use of foreign materials for this purpose is to be condemned, for the introduction of these into the living tissues is against the teachings of both physiology and biology. Such a practice is fraught with danger to the patient, with impermanency in results and with injury to the reputation of the surgeon.

Many years ago I demonstrated that bone and cartilage from the rib of the patient could be used as implants in the correction of certain nasal deformities. Since that time I have used these tissues many times with great satisfaction.

The results of numerous operations upon the human subject, all of which have been subjected to the crucial test of time (some many years), show that periosteum-covered bone and cartilage (without its perichondrium), when *properly* transplanted into the tissues of the patient from whom it had been removed, remains alive in its new position and continues to take a normal part in the metabolic processes of the body.

These conclusions were assailed by some, who, without personal clinical experience in the use of bone as a transplant, preferred to adhere to the theory, long held by some pathologists and others, and copied from one treatise to another, that bone transplants were always absorbed. My conclusions, however, based, as they are, upon clinical results that have stood the test of time, are now established as facts that can no longer be questioned with the sincerity attributable to the scientific mind.

The matter of the permanency of the bone transplant in the tissues is important, for there are some conditions in the nose as well

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as in other parts of the body that demand for their correction rigidity and the other distinctive attributes of bone.

I have always preferred to use a section of the rib as a transplant for the following reasons: It is readily accessible and is easily removed. The layer of compact bone is thin, the cancellous tissue, rich in osteoblasts, is abundant, the vascular supply is ample and a section can be easily shaped to meet the requirements of the case.

Fig. 1. Fig. 2.

Fig. 1. Case 1. Profile before operation.
Fig. 2. Case 1. Profile after correction.

Furthermore, the rib supplies the unique advantage of conjoined bone and cartilage, and at their junction the rib is thick and composed chiefly of cancellous tissue which may be easily shaped to supply the defect. The removal of a section of the rib is attended by neither functional nor material loss, for the gap is quickly filled in with bone developed from the cut ends of the rib. Restitution is usually complete one year after the operation.

Successful transplantation is dependent upon the vitality of the graft, the physiological integrity of the individual, the perfection of the operative technique and the judicious management of the case after operation.

In performing the conjoined bone and cartilage operation I usually resect about two inches of the entire thickness of the rib at the costochondral junction, preserving the periosteum over the outer surface and shelling it out of its posterior covering. The perichondrium is carefully removed, as this would cause the cartilage to curl up. The segment is then split in its vertical diameter and the outer half is shaped to suit the deformity.

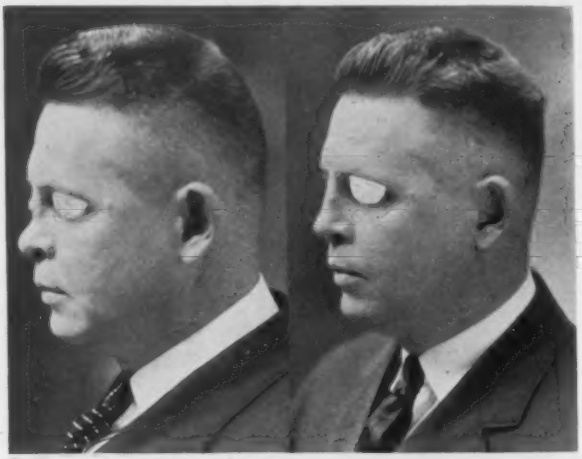

Fig. 3. Fig. 4.

Fig. 3. Case 2. Compound communicated fracture two years after injury.
Fig. 4. Case 2. Same as preceding. Corrected by bone and cartilage transplantation.

The graft is introduced intranasally through an incision in the vestibule and its upper end is mortised into the nasal process of the frontal bone. There is no external incision and no visible scar results from this operation.

Complete protection and immobilization is afforded by a copper splint applied over the entire nose.

Osseous union between the graft and the frontal bone and the upper surface of the nasal bones occurs in about a fortnight. This supplies a firm bony bridge while the cartilaginous end of the transplant supports the tip without destroying its resilience.

The *cartilage* implant never establishes osseous union with the frontal bone or the underlying nasal bones; therefore, it always remains movable to a certain extent. It is chiefly for this reason that I prefer to use bone in restoring the bony bridge of the nose.

Success in the transplantation of bone and cartilage is dependent upon a perfect technique; not only must the field be sterile, but the greatest care must be taken to remove every trace of the chemical agents that may have been used in preparation for the operation.

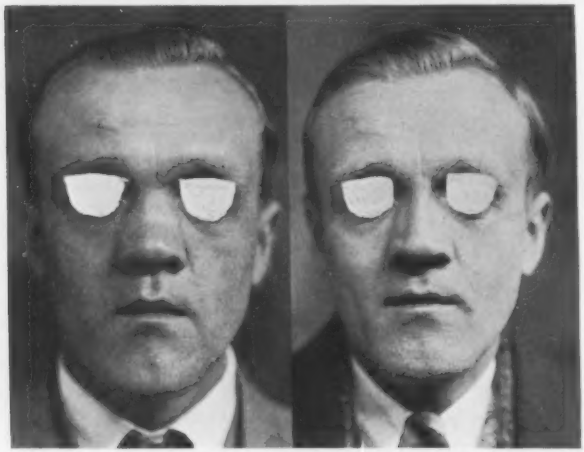

Fig. 5. Fig. 6.

Fig. 5. Case 3. Nose crushed in accident.
Fig. 6. Case 3. Same as Fig. 5. Corrected by intranasal transposition of bone and cartilage.

After thorough sterilization of the field and all possible contacts, only sterile physiological salt solution should be used during the entire operation.

As an implant, cartilage is regarded by many as superior to bone and is used exclusively wherever a graft of any kind is needed.

I have always used both bone and cartilage and believe that each has a distinctive advantage in its place and that the preference must be determined according to the nature of the defect to be corrected.

Cartilage, because of its consistency, has the advantage of being more easily shaped to suit the deformity. Furthermore, it contains

no blood vessels (being nourished only by intercellular circulation), so it is unnecessary for it to be placed in contact with skeletal tissue.

When used as an implant, cartilage becomes incorporated by the surrounding tissues and from these it receives its nourishment.

When cartilage is properly implanted it is never absorbed; its shape, size and consistency remains exactly as it was when introduced. These qualities make this tissue invaluable as a *filler* in defects in the nose. Its function, however, is passive and it cannot be called upon to overcome active resistance, save when it is used in conjunction with bone, for it never establishes a firm osseous connection with bone which is sometimes a necessary consideration in order to provide a fixed point for leverage.

Implants composed entirely of cartilage should be used in the correction of minor defects in the contour of the nose. They may be used also in reconstruction of the cartilaginous portion of the nasal bridge in those cases where there is a firm basis upon which the implant may rest.

Despite our most assiduous attention to all of the rules of antisepsis and asepsis, infections will occasionally occur, just as in any other surgical procedure. It is well to be prepared for this contingency and to know what to do should this complication arise.

Apparently bone, considering the entire graft, is less susceptible to infection and the presence of pus than cartilage. This impression is gained from my experience with infection in cases where I have used transplants composed of both bone and cartilage and have been able to save at least a portion of the bone, but only after the cartilage, which was completely devitalized, had been removed.

Bone transplants, subjected to infection, may be partially or completely devitalized, depending upon the success or failure of our efforts to control the infection in its early stages. If infection occurs, even though we are able to control it promptly, portions of the bone will be devitalized and subsequently absorbed, while those portions that have not been affected will continue to live.

X-ray films, made several months after the operation, will give an irregular, dendritic appearance to the graft; the serrations corresponding to the areas of bone absorption.

In those cases where the infection has been quickly eradicated by repeated irrigations with Dakin's solution through the original

incision, the correction of the deformity is usually not interfered with. This is probably due to the fact that the areas of absorption become filled with connective tissue which eventually becomes ossified.

CONCLUSIONS.

In conclusion I will say that the use of autogenous bone and cartilage implants is strictly in accordance with the rules of scientific surgery and these tissues should always be used in supplying defects in the framework of the nose.

140 East 54th Street.

RESEARCH STUDY CLUB OF LOS ANGELES.

The Research Study Club of Los Angeles will present its third mid-winter course, Jan. 15 to Jan. 26, 1934, inclusive. Guest lecturers in Otolaryngology will include Dr. John Barnhill, of Miami, Florida; Dr. E. C. Sewall, of San Francisco, California, and Dr. Harry L. Baum, of Denver, Colorado. Dr. Barnhill will give a course in dissection and surgery on the cadaver. This was the most popular feature of the course last year.

The guest lecturers in Ophthalmology will be Professor A. Elschnig, of the German University Eye Clinic, Prague, Czecho-Slovakia, and Dr. Hans Barkan, of San Francisco.

The lectures have been so arranged this year that participants in the course may take all ophthalmological and otolaryngological subjects without overlappage.

For further information and a detailed program, address the Secretary, Dr. Don Dryer, 2007 Wilshire boulevard, Los Angeles, California.

ACCIDENT — LOST END SPHENOID PROBE RECOVERED FROM NASAL MEATUS.*

DR. J. IVIMEY DOWLING, Albany, N. Y.

Surgical accidents frequently lead to unfortunate malpractice suits in which the aggrieved patient always places a much greater value upon the possible results of the accident than he does upon the successful issue of required surgery. The brilliant success of skilled surgery is frequently considered of little value, but the unfortunate sequellae of surgical accidents are generally greatly overrated in a monetary sense. Perhaps the abdominal surgeon has been most often the victim of misfortune and, contrariwise, the rhinologist is the least often brought to suit.

That the rhinologist may be the victim of misfortune is the purpose of this brief report of an accident incident to probing the sphenoid cavity. The rarity of the accident is sufficient reason for presenting this report.

The case in point is that of Mr. H., who suffered with sphenoiditis. Repeated probings were without accident, but at the last attempt, although successful in entering the cavity, upon attempting to withdraw the instrument, the bulbous end seemed to be gripped and needed a forcible pull before being released, which was accomplished suddenly and with a sense as though the end had parted from the probe. Examination of the probe proved this a fact for the bulbous tip and 15 m.m. of the stem had been lost somewhere in the nose.

The natural inference was that it had fallen into the sphenoid cavity and this seemed most likely after careful search of the nasal meati failed to locate it.

The patient was sent at once to the hospital for purpose of securing radiograms of the sinuses. Dr. Donald D. Prentice, of the Memorial Hospital, Albany, N. Y., reported as follows:

"There is no evidence of pathology within the sinuses of the skull. In the right nasal fossa lying anteriorly and on the floor is

*Presented before the Eastern New York Eye, Ear, Nose and Throat Association.

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a metallic foreign body with rounded expanded end about 1.5 cm. in length, possibly part of a probe."

Personal examination of the radiogram showed that the broken portion of the probe had become reversed so that the bulbous tip was most anterior and the broken end pointed toward the pharynx.

Before the patient reported again at the office he had dislodged and recovered the foreign body. He handed it over with the simple comment that, "We are all lucky." A true gentleman and sport was that patient and even more, for he was grateful for the relief attained through treatment.

Record of this case would be incomplete without further study to discover the reason for its occurrence.

With this object in view the damaged probe was submitted to the research department of the General Electric Company at Schenectady. Dr. Willis G. Whitney was most interested and directed the investigation under the personal supervision of L. L. Wyman. After careful microscopic study of the instrument in question the following reports were submitted:

"February 3, 1933.

"Dr. J. Ivimey Dowling,

116 Washington Avenue, Albany, N. Y.

"Dear Dr. Dowling: I enclose photomicrographs of the probe you gave me, together with the microscopist's letter.

"It looks as though this particular piece of metal contained a lot of slag, or inclusions. They are the black spots, as at (A). This, I think, would make the steel quite apt to break, under the nickel-plating, on being bent back and forth.

"I should be glad to look at another probe of the same general kind, as it may be that only this particular sample is poor metal. If others of the same sort show this 'dirty metal' character, manufacturers ought to be told of it. I assume they make probes of soft (low carbon) steel, so as to permit considerable reshaping in the hands of the doctor. It is important to have good metal for such rebending.

Yours very truly,

(Signed) "W. R. WHITNEY."

"Schenectady, February 2, 1933.

"Dr. W. R. Whitney,

Research Laboratory, Bldg. 5.

"I have examined the probe, which you received from Dr. Dowling, of Albany, as mentioned in your letter of January 22.

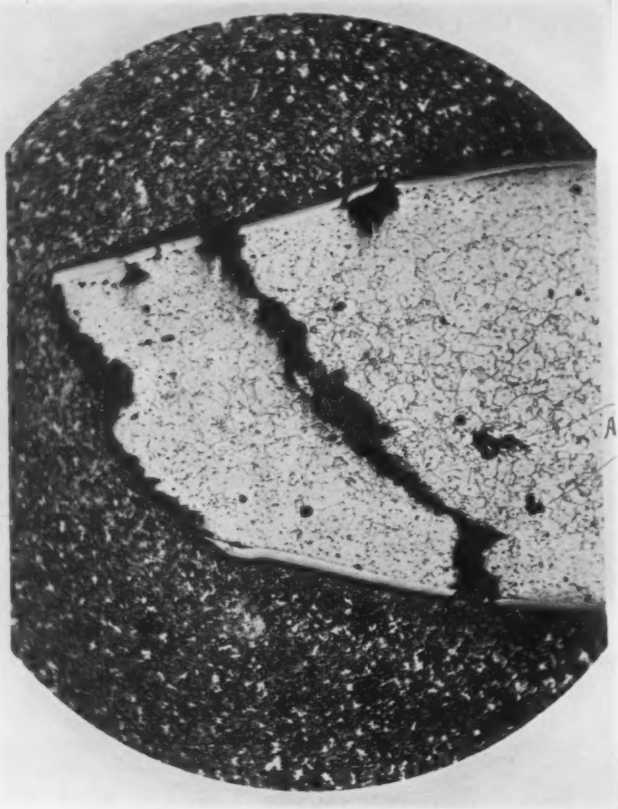


Fig. 1.

"This probe is made of very low carbon steel, and is in an annealed condition.

"The rounded tip of the probe was apparently formed by a cold heading operation, as evidenced by the cross-grain in this head. The

heading operation must have been followed by an anneal, as all of the outer portions of this head are in a recrystallized state.

"Examination of the stem, including the portions surrounding the break, gives no indication of cold working.

Fig. 2.

"I am including three photomicrographs of this probe which show the conditions existant, and also indicate the source of trouble.

"No. 1 is a longitudinal section along the stem of the probe, some distance back of the break. This shows a typical low-carbon steel structure; but, in addition, it may be seen that there is an inexcusable amount of nonmetallic material, in rather large particles, scattered throughout the section.

"No. 2 shows the section which broke, seen longitudinally. It is apparent that there was one complete break, but that a crack occurred all across this section, adjacent to the actual break. Further examination shows several areas of included matter to lie adjacent

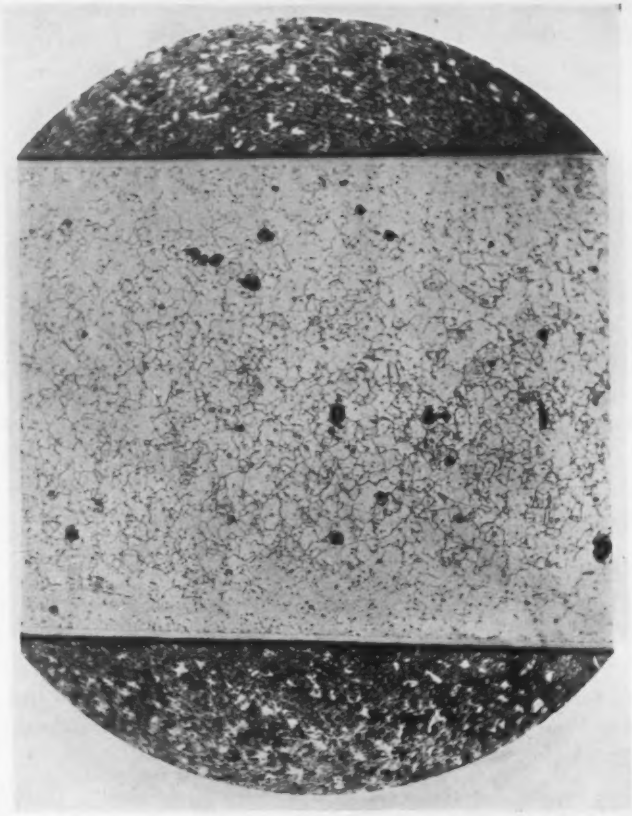


Fig. 3.

the surface, just beneath the plating. Such occurrences weaken the material very considerably. In addition extraordinarily large amounts of inclusions are present.

"No. 3 shows the end of the probe, revealing the cross-grain appearance, due to the heading, the recrystallized zone caused by the anneal, and also large dirt particles near the center of the head.

"In my opinion, the causes of the break are all due to poor material. The presence of the dirt in this material is inexcusable and, I believe, the use of this low carbon stock for such purposes is ill advised.

"The use of such material may, of course, be attributed to lack of knowledge, neglect, or desire for cheapness of stock.

(Signed) "L. L. WYMAN,
"RESEARCH LABORATORY."

Fig. 4. Lateral and front views. Broken end of probe shown on the floor of the nose.

The reports are self-explanatory and the five photographic pictures, herewith submitted, aid in understanding the actual phases of the accident and the reasons for the occurrence.

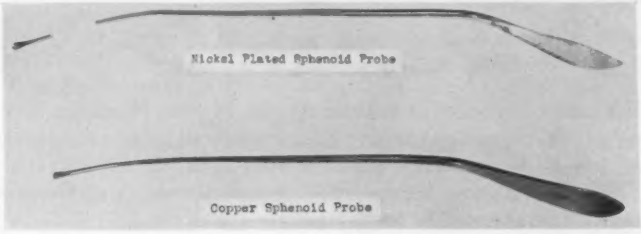
Explanation for failure to discover the missing body is that it rested under the scroll of the inferior turbinated body and search of that region with a probe was not even suggestive.

The reason for the accident was believed, originally, that the probe had become weakened through repeated boiling and long use and the strain of withdrawing it from the sphenoid ostium was sufficient to cause the break; however, examination of the photomicrographs disprove this idea and afford the true scientific explanation.

The value of the experience is that no ordinary metal probe should be used for probing the hidden cavities because of this possible accident.

Copper probes are not liable to such danger and so I have had Meyrowitz make probes of like kind of copper and I am assured that no such misfortune is now likely. Copper probes are, therefore, advised for such purposes.

The writer wishes to express his appreciation to the General Electric Company at Schenectady for the hearty cooperation under direction of Dr. Willis G. Whitney and his assistant, in furnishing the scientific studies embodied in this treatise.



RESEARCH LABORATORY—GENERAL ELECTRIC CO.—METALLOGRAPHIC LABORATORY. PHOTOGRAPHIC MAGNIFICATION, 125.

Material: Steel.
From: Lab.
Etch: Nital.
Instrument: Leitz.
Vibration Absorbers: Yes.
Illumination: Arc.
Filter: Green.
Conical Stop: 4.
Illumination Focus: 3.
Objective: 16 mm. Z.
Ocular: 6x.
Type Illumination: Prism.
Camera Extension: 400.
Exposure: Air, 30".

DEVELOPMENT.

Plates: C P.
Size: 8x10.
Developer: D 11.
Temperature: 65°.
Time: 7.
Drying: Air.

REMARKS.

Probe from Dr. Dowling in Albany.

See letter to Dr. Whitney of Feb. 2, 1933.

Reference: Dr. W. R. Whitney. Feb. 1, 1933. Sample No. 746. Plate No. 637.

116 Washington Avenue.

NASAL PAPILLOMA, WITH REPORT OF A CASE WITH AN ENORMOUS NASOPHARYNGEAL EXTENSION.

Dr. Walter A. Wells, Washington, D. C.

About two years ago I was called to see a case on my service at the Episcopal Eye, Ear and Throat Hospital, which presented features of extraordinary interest, and proved to be one of extreme rarity.

The patient was age 70 years, an inmate of an old men's home, where he continued actively at work at his trade.

He claimed to feel well and strong, and his chief reason for applying to the clinic was one arising from considerations of vanity rather than health. He was embarrassed because a growth in the right side of his nose had now become so large that it made its appearance externally, and could be seen overlying the upper lip. There was complete nasal obstruction on the right side, and he was conscious of the sensation of a lump in his throat on swallowing.

On examination, we discovered a tumor of enormous size filling up the entire nasopharyngeal space, and extending downward well below the level of the soft palate almost to the root of the tongue.

We obtained a history of nasal obstruction dating back over a period of twelve years, and of a removal two or three years ago of a growth attended by severe hemorrhage.

The general condition of the patient seemed to be fair, except for evidences of an advanced arteriosclerosis. He slept and ate well; had lost no weight, and suffered no pain; there were no signs of cachexia; no adenopathy; no metastasis.

The growths in the nose were found to be movable and of a pedunculated form, suggesting polyp; but they had not the elastic consistency nor translucent appearance characteristic of the ordinary nasal polyp.

They were of a dull red, opaque appearance, of rather compact texture.

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So completely was the nasal cavity packed with the growth it was impossible to make out with certainty the attachment or place of origin. The probe, however, indicated that there was no attachment along the floor or on the septal side of the fossa.

With a polyp snare, a piece the size of the first joint of the thumb, was removed for examination. It was at once apparent that the growth was not of a myxomatous nature because the wire loop, instead of causing a constriction, cut as through a piece of solid flesh, and there was a profuse hemorrhage. It was reported from the laboratory that microscopical examination showed the growth to be a papilloma.

Having had no experience with tumors of this nature in the nose, we requested a more particular account of the biological findings. This was given as follows: "Sections have a definite papillary structure with a covering of epithelium of rather varying thickness, generally well defined from the stroma. The epithelium is of an elongated type, arranged chiefly perpendicularly or radially to the surface and the central portion of the mass. These cells are for the most part of nearly uniform size and morphology, though variations in size and some irregularities in arrangement are noted. A considerable number of mitotic figures are seen apparently more commonly toward the deeper edge of the epithelial border. While the lower border is, as indicated, sharply differentiated from the underlying stroma, there is a definite lobulation and budding, and in a number of places a suggestion of fraying the edge, and occasionally of actual invasion.

"The tumor is papillary carcinoma, probably of low grade malignancy."

As already indicated, there was nothing in the general condition of the patient to support the suspicion of malignancy and, considering the long duration of the malady, it seemed very improbable. Locally, the only symptoms which might be regarded as favoring such a diagnosis were the tendency to recurrence and the excessive bleeding. We might expect in such a case ulceration, fetid discharge, pain, infiltration of neighboring structures with malformation, none of which were present.

Nevertheless, in view of the microscopical report, it was thought that the growth was at least potentially malignant and might suddenly take a malignant form; and therefore ought to be as soon as possible completely eradicated.

On account of the danger of excessive hemorrhage, and especially on account of the inaccessibility of the nasopharynx for postnasal packing, we felt that a preliminary ligation of the carotid was in order. This, however, the internist consultant regarded as positively contraindicated, owing to the highly atheromatous state of the arteries in this area. We were, therefore, left with no alternative than to proceed to removal in the best way possible and take chances on the bleeding.

We decided, however, to give the patient the benefit of X-ray treatment. Three exposures were given at proper intervals. At the conclusion, we could not see that there was any diminution in the size of the tumor, either in the nose or in the throat.

That the X-ray was nevertheless helpful was evident in the lessened bleeding attendant upon subsequent operations for removal. There had been brought about, no doubt, a certain amount of fibrosis which had the effect of lessening the vascularity of the growth.

By a few sittings, each followed by a firm packing, the nasal fossa was rendered practically free. It now became possible to identify the ethmoid region as the base of the implantation of the growth, and on account of a complete shadow over the infraorbital region on transillumination, there was little doubt that the maxillary antrum was also involved.

With nasal passageway clear for the introduction, if necessary, of a postnasal plug, we felt justified in proceeding to the removal of large postnasal tumors.

Of much tougher consistency than the intranasal growth, they presented themselves in the form of two large pear-shaped movable tumors, occupying the greater part of the space of the oro- as well as the nasopharynx.

The cold wire snare introduced by way of the mouth was made to encircle the body of the growth and carried up as close as possible to the point of exit from the choana, using slow and gradual strangulation, the hemorrhage proved to be less than expected. Two large tumors, each the size of a hen's egg, were removed.

After a few days, the patient was sent home, and was not again back until four months later. There had been some recurrence of the growth, especially in the posterior part of the fossa, but there was still good breathing room on that side. The general condition of the patient remained good. On account of the inherent tendency

to recur, and the impossibility of complete eradication, we recommended that the patient submit to further X-ray or radium treatment. On account of his advanced age and bad arteries, it did not seem advisable to operate radically upon the ethmoid and antrum.

We made inquiry after the lapse of a year, and learned that the patient had received the X-ray treatment as directed and that he was getting along very well. He was still plying his trade, as before, as shoemaker at the institution of which he was an inmate.

The first mention to be found in medical literature of nasal papilloma was in a report made by Michel,[1] of Cologne, in the year 1876. The subject was, however, not brought prominently to the attention of the profession until 1883, when Hoffman[2] published a paper on the subject, embodying a report of fourteen alleged cases.

Immediately thereafter, reports of similar cases emanated from several quarters. But in the year 1889, Noquet,[3] a French laryngologist, on the basis of more accurate histological studies, challenged the diagnosis of Hoffman and most of his followers.

A true papilloma, he declared, was of exceedingly rare occurrence, and most of the cases that had been so-called were in reality cases of inflammatory hyperplasis or compressed polypoid growths; while others should be classed as adenoma, angioma, or sarcoma.

Jonathan Wright,[4] of New York, who was a pathologist, as well as a laryngologist, from studies made about the same time, arrived at exactly the same conclusion. He reported in 1891 a case of what he considered to be a true nasal papilloma, and asserted that of all the cases previously reported in the literature, not more than one or two could be accepted as histologically genuine.

From this time on, greater discrimination was exercised in the diagnosis, and only a very few cases were reported.

Pulsatelli,[5] in 1915, estimated that from all sources the total number of true cases of papilloma reported up to that time did not exceed thirty.

Bilancioni,[6] in 1917, accepted as many as forty cases; but Herxheimer, five years later, lowered the number to thirty-eight.

Eckert-Mobius,[7] in a review of the subject in 1929, estimated the whole number up to that date as sixty; and still more recently a study was made by Massioni,[8] who in 1931 collected from the literature of all countries 144 cases, of which, however, not more than 100 he maintained could be considered genuine.

We can almost count on the fingers of two hands all the cases in which there is mention of location of the growth in the nasopharynx.

If we exclude cases such as those of Tilly,[9] of Hill[10] and of Leale,[11] of small warty growth attached to the posterior border of the vomen, or of Bruggeman,[12] which had an excrescence on the posterior end of the inferior turbinal, or of Hanneman,[13] who describes a small pedunculated growth situated near the mouth of the sphenoid ostium; and if we exclude also cases of Gonzales[14] and of Brock,[15] in which the postnasal growth appeared only after removal of intranasal ones, there will be left hardly more than can be counted on the fingers of one hand.

Gonzales' case was definitely malignant; ulceration of the septum occurred, followed by involvement of the orbit and of the ethmoid and sphenoid sinuses with a fatal termination. Brock's case was that of a woman, age 64 years, in which ethmoid and maxillary sinuses were involved, for which numerous radical operations were done. Finally a cauliflower-like growth was observed occupying the vault of the pharynx.

We have to mention the case, reported in 1906 by Schmidt,[16] of a man, age 47 years, having a large, reddish mass in vault of nasopharynx resembling adenoid, but microscopically demonstrated to be a papilloma; the case Marabaix[17] reported in 1911, of a woman, age 67 years, papilloma involving ethmoid frontal and maxillary, was complicated with very vascular tumor of cauliflower form extending into the nasopharynx; and the case of Callison[18] (1916) in which, besides the growth in the nose, there was also to be seen by posterior rhinoscopy a growth in the nasopharynx large enough to hide a view of the septum.

We have been able to find in all the literature only four cases of papilloma of the nasopharynx that could be considered as comparable to our own.

The first was that reported by Sendziak[19] in 1890. The patient was a man, age 53 years, who had in his postnasal space a soft, pale tumor that measured 6 cm. in length, 5cm. in the transverse diameter and 2.5 cm. thick.

The second was that mentioned by Jurasz[20] (1892), who saw an asthmatic boy, age 13 years, in whom he found a hard, smooth, pedunculated tumor, 3 cm. long, proved by microscopical examination to be a pure papilloma.

The third, Newman[21] (1898) reports the case of a young man with a papillomatous growth in his nasopharynx the size of a hen's egg.

The fourth, Schroetter[22] (1901), whose patient was that of a woman, age 27 years, having a growth filling the right nasal fossa, besides a large lobulated tumor extending into the nasopharynx.

A papilloma is, according to the pathologists, in reality a fibro-epithelial tumor. There is always some overgrowth of both these types of structure, but the chief proliferation is in the epithelial element.

There is usually an enormous overproduction of the epithelial investment, and as this takes place in an uneven way, the surface is alternately elevated and depressed, giving rise to the characteristic papillary appearance.

The connective tissue growth is comparatively slight—just enough to constitute a supporting framework, generally in the form of slender stalks which serve to carry the blood vessels.

The rich vascular supply usually present explains the marked hemorrhagic character of these growths, and also probably their tendency to rapid recurrence.

It is claimed that all genuine papillomata are marked by two essential features: *1.* The cells are of normal type; *2.* there is a sharp demarcation in the boundary separating the two tissue elements. This boundary is represented by the delicate base-members, which should not be penetrated or broken.

Some authorities maintain that the papilloma is not a true tumor, but rather an inflammatory hyperplasia. A neoplasm differs from a hyperplasia in that, in the former, the incentive to grow is some way inherent in the cell itself; in hyperplasia, the proliferation is due to an external irritant.

There is evidence that papilloma in some locations, as for example, the papilloma of the larynx, may have an infectious origin, and this may be true of some nasal papillomata, but certainly not all.

The papilloma occurring within the nose are evidently of two different types. The Germans have clearly recognized a distinction and adopted a classification into hard and soft. According to some, it is only the hard variety that is to be regarded as the true papilloma.

Originally it was thought that the hard papillomata were characterized by an exclusive proliferation of the pavement type of epithelium as distinguished from the soft, in which the epithelial investment was supposed to consist entirely of columnar, or cylindrical cells.

This distinction, however, was shown by actual experience to be untenable.

Herxheimer,[23] in 1900, reported a case of hard papilloma, in which the epithelial investment was composed exclusively of cylindrical cells; and since then, both hard and soft tumors have been seen with mixed types and transitional forms.

It is probable, therefore, that the texture of the growth giving rise to the designations hard and soft depends not at all upon the character of the epithelial, but rather upon the connective tissue content.

From our survey of the literature, we have come to the conclusion that nasal papillomata may be very correctly, as well as conveniently classified according to their location: *a.* those located in the vestibule of the nose, and in the posterior choana; *b.* those deep within the nasal fossa, and in the sinuses.

The papilloma having either a vestibular or choanal location will nearly always be found to be a single, small sessile, circumscribed growth, assuming in many cases a mulberry-like form.

In the vestibule, it takes its origin close to the mucocutaneous junction, and may be seated either on the anterior part of the septum or the floor. The investment is usually, as we would naturally expect, of pavement epithelium.

A similar growth is sometimes found in the choanal region, or attached to the posterior end of the septum.

The papillomata which are attached deeply within the nasal fossa are mutliple, exuberant growths, which appear either in the form of cauliflower vegetations, or as pedunculated tumors.

They seem in most cases to spring from the region of the middle meatus and to involve the ethmoid. In many cases the maxillary sinus is involved, and sometimes completely filled with the tumor mass.

They are generally invested with the cylindrical type of epithelium. When this is replaced, as is sometimes the case, by the pavement type or mixed forms, it is a question if this is not due to transformation of type as result of friction.

Is nasal papilloma to be regarded as a strictly benign growth, or as one of potential malignancy?

A malignant clinical course was assumed in quite a number of the cases reported, and this, strange to say, sometimes in spite of complete absence of evidence of malignancy in the histological examination. Such, for instance, were the cases of Verneuil,[24] Gonzales[14] and Bilancioni.[6]

On the other hand, my case, although pronounced malignant on the grounds of the microscopical findings, must be regarded as benign, in view of long duration of the illness—twelve years before first seen by me, and now over one year since, with no impairment of the general health.

We would expect a malignant growth in the nose to manifest itself by ulceration, hemorrhage, a foul discharge, invasion and infiltration of adjacent structures with malformation of the parts, and rapid recurrence after removal.

Sooner or later, there should appear adenopathies and metastases, and inevitably there must develop a severe anemia and cachexia, ending in a few years, if not months, in death.

In the majority of the cases reported, we remark only two symptoms that belong regularly to the picture of malignancy, viz., hemorrhage and prompt recurrence after removal. The other features were usually absent, and it is remarkable how few deaths are recorded, although many of the cases were followed over a period of years.

Banks-Davis[25] mentions a case in a man, age 64 years, under observation for fourteen years and with no evidence of ill health.

Aloin and Duplant[26] report a case of mulberry growth, involving the ethmoid region in a woman, age 70 years, regarded by his colleagues, as well as himself, as certainly a malignant; yet, after five operations, the patient at the end of four years, was as well as ever.

Durand[27] reported a case occurring in a man, age 40 years, a tubercular subject, which microscopical examination proved it to be of the pavement epithelial type, with some mitoses present. Although observed for five years, no sign of malignancy developed.

Callison reports a case of an extensive growth occurring in a colored woman, age 40 years, with a history of twelve years' duration, with no ill health.

From the histological viewpoint, papillomatous growths may properly be regarded as benign, so long as the nasal membrane remains intact and serves as an effectual barrier to invasion of the epithelial elements into the underlying connective tissue layer. If this becomes broken through, and embryonic cells appear in the deeper vascular layers, the diagnosis of malignancy is justified.

There have been two or three cases which can be cited as positive proof of histological transformation of a benign into a malignant growth.

Especially convincing is the case reported by Hellman,[28] of a patient who had been under observation for twelve years, and treated by several of the most eminent laryngologists of Europe; among them, Kresselbach, Schech and Seibert. The last mentioned had made careful microscopical studies of sections of the tumor taken from the nose, which showed it to be a case of pure benign papilloma.

Later the growth began to extend and the frontal sinus became involved. Radical operation was performed with a fatal result. Microscopical examination showed that the tumor had undergone malignant degeneration.

Von Bungner[29] and Poli[30] also have reported a case in which apparently there had been a transformation of a benign into a malignant form.

It seems to us, therefore, that the nasal papilloma, at least that variety which invades the deeper part of the nose, especially the sinuses, has always with it the seed of malignancy; though what it is that determines its development in that direction, it is not possible to say. We believe that this lesion cannot be regarded as belonging exclusively either to the benign or the malignant class of growth, but rather as occupying an intermediary place, and as always, potentially malignant.

As regards treatment, this must differ according to the group to which the case belongs.

The vestibular growth being, as a rule, small and circumscribed, can and should be radically removed.

But the thickly set multiple growths located deeply within the nasal fossa, especially if involving the ethmoid and the sinus, generally defy by the nature of things a complete eradication. Attempts in this direction were almost invariably followed by recurrence, and it is a fact that it was in those cases in which extensive radical operations were done that the fatal results occurred.

Treatment by X-ray or radium was reported in but few instances, but in those excellent results are reported.

Even though it may not bring about a complete absorption of the growth, we may at least expect from it, as in my case, a beneficial effect in lessening the vascularity and thus discouraging recurrence and growth.

SUMMARY AND CONCLUSIONS.

1. Papilloma of the nose is a growth of extreme rarity, not more than 100 cases having been collected from all the literature to date.

2. Two distinct types occur, of about equal incidence: *a.* vestibular-choanal, generally single and circumscribed; *b.* that seated deep in the fossa and involving the sinuses, generally multiple. Of these, not more than a half-dozen have been reported with large nasopharyngeal extension.

3. Papilloma springing from sinuses usually assume a pedunculated or cauliflower form, grow rapidly, recur quickly after removal, and are very vascular.

4. Nasal papilloma cannot be classed definitely either as a benign or malignant growth, but as intermedial between the two. There are authenticated instances of transformation of benign into malignant type.

5. Radical operation of cases involving the sinuses have been generally unsuccessful. X-ray is beneficial and indicated in all cases.

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1606 Twentieth Street, N.W.

LIGATION OF THE EXTERNAL CAROTID ARTERY FOR UNCONTROLLABLE HEMORRHAGE IN A CASE OF PERITONSILLAR INFECTION.*†

DR. SAMUEL D. GREENFIELD, Brooklyn.

Ligation of the carotids for uncontrollable hemorrhage from the throat is not a common practice; however, the occasion does arise when the ordinary methods for combatting profuse hemorrhage have failed, and the only recourse the surgeon has to prevent exsanguination is the ligation of the main vessel that supplies this region.

In peritonsillar abscess considerable bleeding may accompany the incision of the tissues, but this as a rule ceases quickly and is no cause for concern. The hemorrhage that is apt to be followed by grave consequences is the so-called secondary type, which occurs most unexpectedly some time after drainage from the abscess cavity has been established. In 1928† I reported a series of 290 cases of peritonsillar infection. There occurred in this entire series only three cases of severe secondary hemorrhage. In all three, transfusions were given, but in no case did I have to resort to ligation of the carotid.

Secondary hemorrhage in peritonsillar abscess results from the erosion into one of the larger vessels in the vicinity of the suppurative process. This erosive action may take place in an abscess that has ruptured spontaneously as well as one in which incision has been practiced. In other words, one is hardly justified in attributing this secondary hemorrhage to injury by the surgeon's knife; an opinion that I have often heard voiced.

Peritonsillar abscess is as a rule a more or less superficial process. It is a notable fact that serious hemorrhage is more apt to occur in patients in whom infection has been permitted to go on over a prolonged period without evacuation of the products of suppura-

*Read before the Kings County Medical Society, Otolaryngological Section, Dec. 1932.

†Greenfield, Samuel D.: Peritonsillar Infection. Archiv. Oto-Laryngol., Vol. 7, pp. 239-256, Mar., 1928.

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tion. In cases of this kind the infection is given more opportunity to burrow its way into the deeper tissues of the neck in which are located the larger blood vessels.

Autopsies in patients who have succumbed to this complication have revealed the fact that the erosion may take place more commonly in the lingual, facial and the ascending pharyngeal, all branches of the external carotid, and less commonly in the internal carotid itself. Clinically there is nothing to indicate which vessel is involved so that the procedure selected by the surgeon must to a great extent depend upon his experience and his judgment.

In a review of the literature for the past twenty years, thirty-one cases of serious hemorrhage have been reported. They have been divided into three types, based upon the form of treatment employed.

In Group 1 ligation of the common carotid was practiced, with recovery in 66 per cent of the cases. In Group 2 the external carotid was ligated and the recoveries were 44 per cent. In Group 3 the cases were treated conservatively and only 23 per cent recovered. From these statistics one would most assuredly conclude that the proper procedure would be to ligate the common carotid in all cases.

One must bear in mind, however, that ligation of the common carotid is not entirely free from danger at the time of the operation nor is it devoid of sequellae that may develop subsequently. Sudden cessation of the circulation may result in a most deleterious effect upon the brain with softening and degeneration of that portion supplied by the ligated vessel. This complication may develop shortly after ligation or appear several days or weeks later.

Ligation of the external carotid, however, is devoid of any such complications as those attributed to similar treatment of the common carotid. It is a safe and quick procedure and, owing to the fact that it has been shown that branches of the external carotid are most often implicated, it should suffice in the majority of instances. I should be inclined, therefore, to ligate the external carotid first and await results. If the bleeding persists to any great extent, and one is certain it is not the slight oozing that results from collateral circulation, then one must proceed to ligate the common carotid.

The case I am reporting is one in which, with this thought in mind, I ligated the external carotid. The bleeding ceased immediately and necessitated no further manipulation. The patient made an uneventful recovery.

Case Report: Mrs. M. S., age 30 years, was admitted to the Beth Moses Hospital on May 4, 1932. Her chief complaint was bleeding from the throat, and dysphagia.

Previous Personal History: The patient had enjoyed comparatively good health. She had suffered sore throats frequently. In 1929 and again in 1931 she had a quinsy and on both occasions the abscess had to be incised.

Present Complaint: Two weeks prior to admission to the hospital the patient had an attack of tonsillitis, which was followed by a peritonsillar infection on the same side on which she had her previous attacks. She did not seek medical attention until the fifth day, when her physician incised the abscess. She was apparently not relieved because she saw another laryngologist two days later and again her abscess was incised. The day after the second incision she bled profusely and her physician attempted to control the bleeding by packing the incision with iodoform gauze. The bleeding was temporarily controlled but twenty-four hours later, after the packing was removed, she again bled profusely. She refused to have her throat packed by her physician and she went on until the day of her admission to the hospital, bleeding intermittently.

At the time of her admission her hemoglobin was 40 per cent and her red count was a little over 2,000,000. The blood picture otherwise was normal. She was expectorating blood continuously in copious amounts. Examination of her throat revealed marked swelling and infiltration of her right soft palate. There were two gaping wounds in the anterior pillar, one running transversely and a lower oblique one. From both wounds the bleeding was active.

I felt that the only safe procedure was ligation. I decided to expose and ligate the external carotid and if this was not sufficient then to proceed to the common carotid.

Operation: Under general anesthesia I cut down upon the carotid sheath and quickly located the common carotid. I then dissected upward to the bifurcation and visualized the external carotid by its superior thyroid branch coming off close to the bifurcation. The next branch from the external carotid was recognized as the lingual. I placed my ligatures between these two vessels, using twenty-day heavy chromic gut. I did not cut the vessel between ligatures. It was a rather striking feature to note how quickly and completely the bleeding ceased. The patient was typed and a transfusion of 350 cc. was given. The patient went on to a complete recovery and was discharged from the hospital on May 11.

It is of interest to note that I removed this patient's tonsils three months later. Nothing unusual was noted during the operation. However, on the fourth day after removal, she had a most severe secondary hemorrhage from the tonsillar fossa on the side where the external carotid had been ligated. This bleeding was easily controlled with pressure. I mention this fact to point out how readily and completely the collateral circulation is established in this region.

169 New York Avenue.

CONTACT ULCER OF THE LARYNX. REPORT OF A CASE.*

DR. CHARLES J. IMPERATORI, New York.

The title "Contact Ulcer"† is one given by Chevalier Jackson to a superficial ulceration on one or both sides of the larynx, posteriorly, the ulcerated surface coming in contact, on phonation, with that of its fellow of the opposite side, the latter being ulcerated or not, according to whether the ulcer is monolateral or bilateral. They are comparatively of rare occurrence.

Pathologically, they present the usual characteristics of chronic inflammation with ulceration. Usually a chronic productive inflammation with recent edema and congestion or exuberant granulation tissue with ulceration of the surface is what is found on microscopic examination.

There do not seem to be any specific histological characteristics. The location of the lesions is at the vocal processes and posterior to them. Very little has been done on the bacteriology as an etiological factor, although Jackson suggested the possibility of the Vincent's organism.

Symptoms are usually slight to occasional hoarseness. Occasional sharp stabbing pains in the larynx and occasional awakening at night with a choking sensation that is probably caused by an overflow of saliva into the larynx. Because of the chronicity of the lesion, tuberculosis and cancer must be differentiated.

The patient who has this lesion is a healthy, professional man of 44 years. Family history and past history negative insofar as this present condition is concerned. Has never had attacks of laryngitis and has had few colds in the head. While there is no history of voice trauma, he used his voice a great deal and at times excessively. Does not use tobacco and is very moderate in the use of alcohol.

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*Read before the Annual Meeting of the American Laryngological Association, Washington, D. C., May 9, 1933.

†The Nose, Throat and Ear and Their Diseases. Coates and Jackson. Saunders & Co., 1929, pp. 807-808.

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, April 15, 1933.

He was first seen in October, 1931, and gave a history of having had an acute attack of pain in the left ear and neck while touring about a week previously and this was followed by hoarseness and some amount of coughing. Two weeks previously had had a severe head cold and profuse nasal discharge. The night before he came to see me he had had a severe attack of coughing coming on during sleep. There was a slight amount of mucoid secretion expectorated.

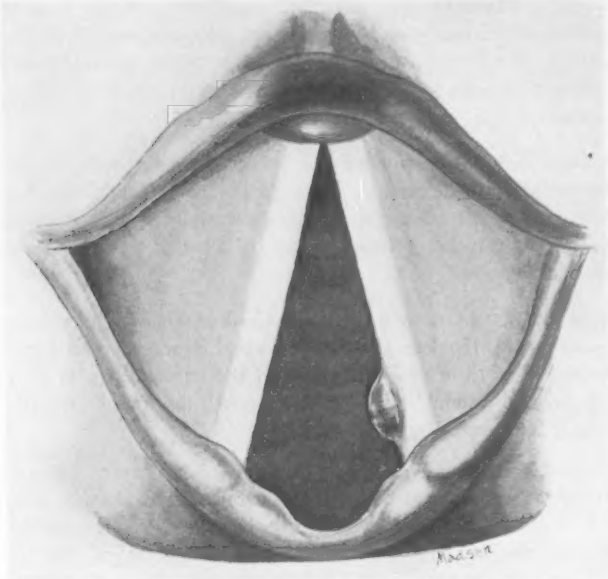


Fig. 1. The vesicular-like lesion seen at the vocal process before rupture. There is no degree of infiltration of the adjacent tissue.

Physical examination of his nose, throat, ears and chest was negative excepting that on the superior surface of the left arytenoid there was a small bleb and on the vocal process there was a small glistening elevation about 3 or 4 mm. in diameter, with a slightly infiltrated base.

There was edema of the uvula. This last was attributed to the severe coughing of the night before.

Within a few days the bleb on the arytenoid disappeared, but the one at the vocal process ruptured and within another few days pre-

sented a typical ulceration but not of any depth. Within a month there were granulations surrounding the site of the ulceration and giving it a cup-shaped appearance.

The vocal cord anterior to the vocal process was not injected to any degree. The right cord was normal. Wassermann reaction and X-Ray of his chest were negative. His sinuses were negative. There was no sputum obtainable for examination.

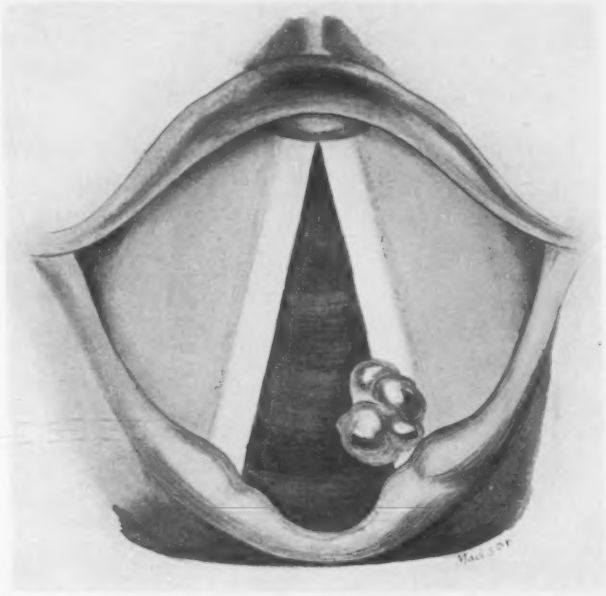


Fig. 2. Granulation tissue at site of vesicle after rupture and ulceration.

The laryngoscopic picture remained essentially the same excepting that there was a gradual lessening of the size of the ulceration and a gradual building up of the granulations so that by the latter part of March, 1931, five months after onset, there was a polypoid mass about 4 mm. in diameter, located at the vocal process.

Voice rest and occasional inhalations had been used. At this time patient was seen by Dr. C. G. Coakley, who felt that the condition was possibly a papilloma and agreed that it might be granulation

tissue. He advised removal, microscopic examination and complete voice rest. His advice was followed and the laboratory report was that the specimen was granulation tissue.

Within a month (April 24, 1932) there was about the same laryngeal picture and a beginning of a cupping on the vocal process of the right cord, so that the granulations on the left cord fitted into it. Cauterization with electric cautery was done at this time and the

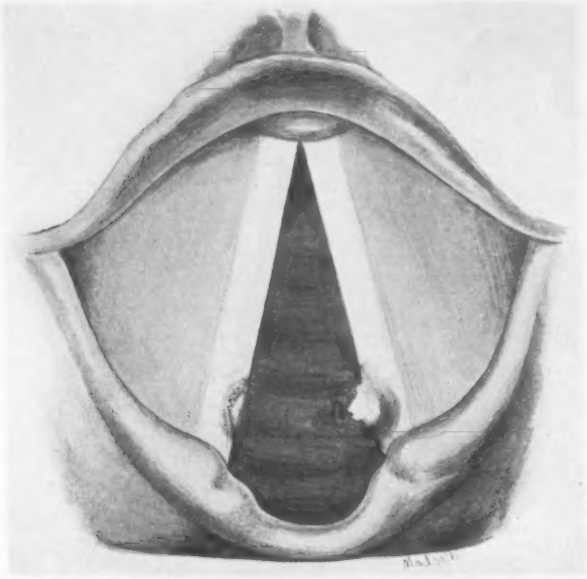


Fig. 3. Appearance of a bilateral lesion with granulations on the left side and superficial ulceration on the right. On phonation these lesions fit into each other.

granulations destroyed. The small ulceration on the right cord disappeared, but the granulations on the left cord reappeared and consultation with Dr. Jackson was had in the early part of June, 1932. His diagnosis was contact ulcer. Wassermann and X-Ray of chest were done by Dr. Jackson. He advised complete voice rest and removal of the granulations when indicated.

The treatment advised was carried out. However, by the end of August, 1932, the granulations on the left cord were about 8

mm. in diameter. These were removed and microscopic examination showed the tissue to be exuberant granulations and no evidence of any new growth.

During the next three months there was a very small ulceration on the left vocal process and a very small granulation on the right cord that fitted into the ulceration on the left cord. During this period, for about one month, applications of 1 per cent silver nitrate were used and not appearing to be of any benefit, were discontinued.

Fig. 4.

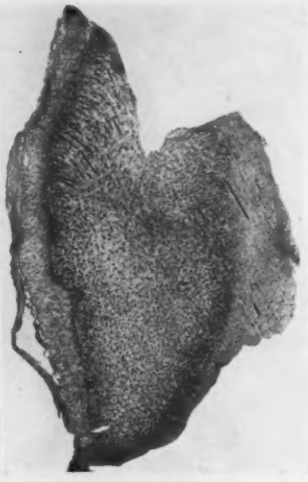


Fig. 4A.

Fig. 4. Photomicrograph showing granulation tissue with necrotic capsule.

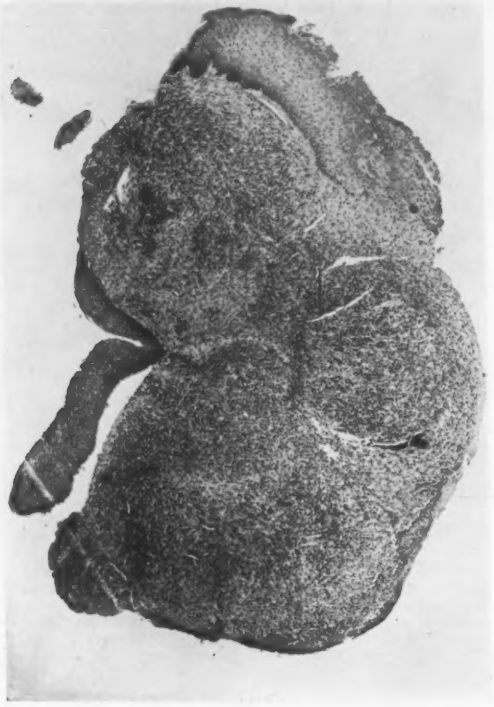
Fig. 4A. Photomicrograph showing chronic productive inflammation with edema and congestion. This is an exuberant granulation. In one corner of the preparation there is a partial epithelial capsule.

A 0.5 per cent solution of zinc chloride was used twice daily for several weeks, but this did not appear to make any difference and this was discontinued. Voice rest was continued. The lesions remained about the same in size and for a period of two weeks previous to Dec. 17, 1932, he was allowed moderate use of his voice. His voice was fairly clear and only occasionally was it husky.

At this time he was again seen by Dr. Jackson. Diagnosis, contact ulcer, with the advice that further study be given the tissues removed. Laryngoscopic picture remained about the same. On Dec.

19, 1932, the lesions were removed from both sides and part of the tissue, after proper preparation, injected into a guinea pig. One month later Koch's Old Tuberculin was injected into the pig.

Later the pig was killed and the lymph nodes examined, but there was no evidence of tuberculosis.



Patient went to Florida and remained there until Feb. 10, 1933, when he returned to New York. Laryngeal examination showed the left cord to be entirely healed and no evidence of any ulceration.

On the right cord there was a small granulomatous mass about 3 mm. in diameter. This was removed and the microscopic examination showed severe chronic productive inflammation, with atypical epithelial cell proliferation. Bacteriological studies were inconclusive.

The patient then returned to Florida and was again seen on March 27, 1933. Laryngoscopic examination at this time showed the left cord entirely healed. The right cord at the side of the ulceration showed a small elevation of about 2 mm. in diameter. No infiltration of the surrounding tissue and normal movement of arytenoids and cords. Voice practically normal.

The mass of granulation tissue with its ulceration was removed on March 30, 1933. Microscopic examination showed chronic inflammation and no cells of atypical growth present.

This area where the ulceration was removed has epithelized and the patient was seen recently and remains cured.

Both cords appear to be normal as regards movement and size.

The voice is normal. There does not appear to be any scar at the site of the ulcerations, probably because of the superficial nature of this condition.

It would seem that the condition spoken of as contact ulcer is what has been described by Virchow* from postmortem findings and by Frankel from clinical observations as pachydermia laryngis.

From the location and macroscopic appearance, they would seem to be similar conditions.

Microscopically the contact ulcer is of a simple inflammatory nature and when changes occur in the blood supply, eventually ulcerates, but ultimately heals.

Pachydermia laryngis is a proliferation of the epithelium and a great multiplication of the papillae.

Ulceration occurs occasionally.

This condition is usually induced by a sinusitis or any other irritation caused by a chronic infection above the larynx. The growth is usually of some size and the common location is in the interarytenoid space, although the vocal processes and the cords may be the site. Contact ulcer is superficial and is always located at or behind the vocal process and commonly the growth is accompanied by a similar condition on the opposite cord, excepting that one is an elevation and the other is an excavation.

*Nose, Throat and Ear. L. Turner. William Wood & Co., 1924, p. 177.

108 E. 38th Street.

FIBROLIPOMA OF THE LARYNX. REPORT OF A CASE.*†

DR. CHARLES J. IMPERATORI, New York.

The patient from whom this growth was removed was a Mrs. A. Z., a widow, age 61 years, a Bohemian by birth.

She was admitted to the New York Post-Graduate Hospital, April 7, 1932, complaining of dyspnea, particularly on exertion, and dysphagia.

General examination showed that she had a moderate degree of cardiovascular disease, diabetes mellitus and a considerable degree of laryngeal obstruction.

Laryngeal examination revealed a large pinkish tumor, rather pyriform in shape and attached by a broad but narrow pedicle to the right arytenoid and aryepiglottic fold. The pedicle, which was very short, seemed to be part of the aryepiglottic fold. The tumor was partly situated in the pharynx, but most of it was in the vestibule of the larynx and practically occluded the entrance of the larynx with the exception of the posterior commissure. The vocal cords could only be seen by grasping the tumor and pulling it to the side. There was no involvement of the vocal cords and while her voice was not hoarse, it was muffled.

Laboratory findings showed 0.86 per cent sugar in the urine and a three plus protein and acetone. Blood sugar was 200.

Medical treatment improved the patient's condition so rapidly that within four days the laboratory reports showed that the urine was free from sugar, albumin and acetone. Her blood sugar was 150.

A preliminary tracheotomy was done April 9, 1932, under local anesthesia, and also a biopsy. The report from the pathologist was that the tissue submitted was that of a fibrolipoma.

On April 15, 1932, under ether anesthesia and in the suspension laryngoscope, it was seen that the tumor was attached to the aryepiglottic fold, right arytenoid and down on the posterior surface of the larynx to the cricoid cartilage.

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*Read before the Annual Meeting of the American Laryngological Association, Washington, D. C., May 9, 1933.

†From the Laryngological Service of the New York Post-Graduate Medical School and Hospital, Columbia University.

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, April 15, 1933.

The tumor was grasped with a uterine volsellum forceps. An incision was made on either side of the pedicle and a partial dissection with scissors was done. Then a large wire loop in a Moseley snare was passed over the growth and the mass removed almost in its entirety. Several tags were removed with large biting forceps. The tumor measured 7x6.6x4.7 cm.

A feeding tube was placed in the esophagus. Because of her diabetes she was fed a special diet; insulin was also given.

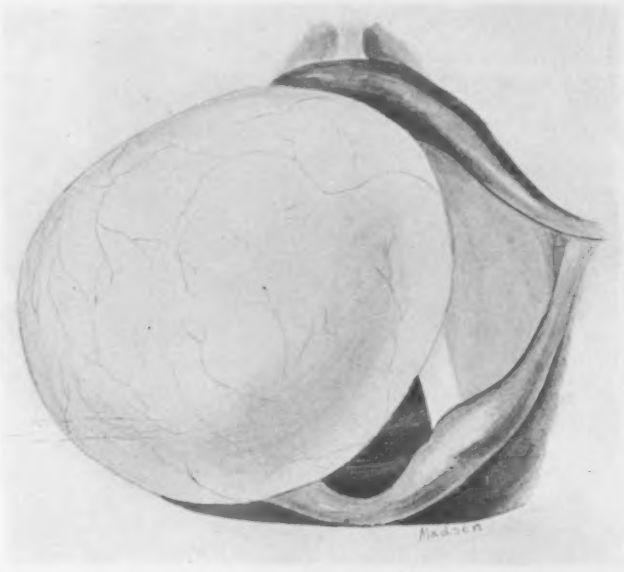

Fig. 1. Fibrolipoma. Encroaching the vestibule of the larynx, so that there is a very small airway, posteriorly. The upper part of the growth is in the lower pharynx.

There was comparatively little reaction, and on the third day postoperative the feeding tube was removed; on the fifth day, the tracheotomy tube was also removed.

The report of the pathologist is that of a fibrolipoma.

Tumors in this location and of this size are not common; I have seen but three others. One was carcinomatous and operated upon, considering that it was a cyst; however, there was no recurrence, and the patient lived for twelve years after removal, dying from a pneumonia.

The other two were branchiogenetic in character. One of these has recurred. All of these patients were females and the location similar.

In one of the patients with the branchiogenetic growth, removal was by thyrotomy.[1] The other three patients were operated upon in the suspension laryngoscope.

Fig. 2. Diagrammatic view of the fibrolipoma in the larynx and laryngopharynx.

Lipoma may be fibromata that undergo fatty degeneration and they show a tendency to recur.

St. Clair Thompson[2] reports less than twenty-five cases.

Chappell reported a similar case before this Association in 1907.

J. Solis Cohen[3] reports a few similar cases. Several of these growths were removed by ligation and strangulation.

Jackson[4] reports seven cases of lipoma of the larynx seen in an experience of forty years.

Fig. 3. Roentgenogram showing lateral view. The growth is seen in outline below the hyoid bone. The vestibule of the larynx is considerably obstructed, but because of the angle that the ray was taken, the growth appears to be situated posteriorly.

Hinkel reported in 1898, before this Association, a lipoma that repeatedly recurred.

Jonathan Wright examined the tissues microscopically.

Max A. Goldstein, in September, 1909, number of THE LARYNGOSCOPE, reported a similar case and twelve others from the literature.

My patient was seen recently and there has been no recurrence.

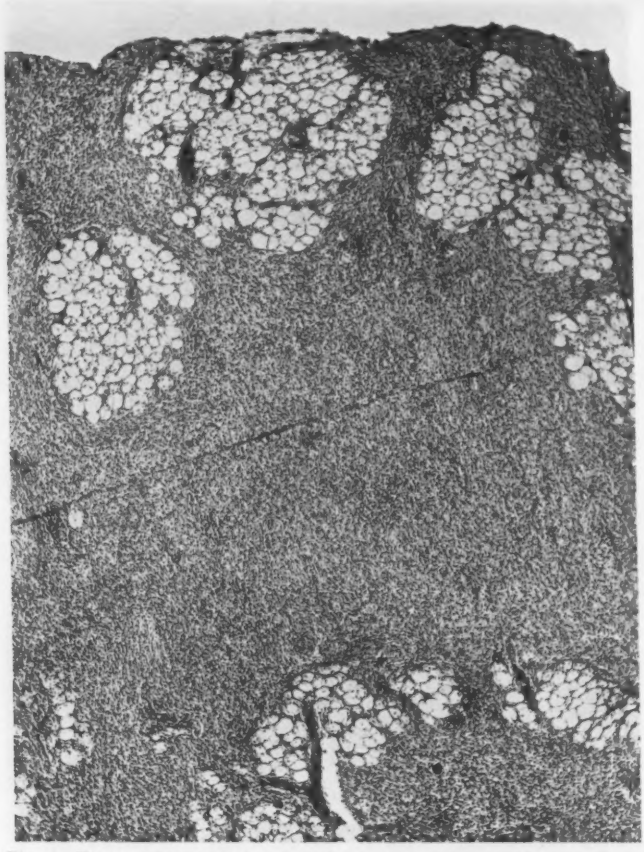

Fig. 4. Photomicrograph showing fibromatous stroma with fat cell scattered in groups.

1. IMPERATORI, CHARLES J.: Branchiogenetic Cyst of the Larynx, Removed by Thyrotomy. THE LARYNGOSCOPE, 1929.
2. THOMPSON, ST. CLAIR: Diseases Nose and Throat. Third Edition, p. 554.
3. COHEN, J. SOLIS: Diseases of the Throat. Wm. Wood & Co., 1872, p. 227.
4. JACKSON and COATES: Nose, Throat and Ear and Their Diseases. W. B. Saunders & Co., p. 900.

108 East 38th Street.

RHABDOMYOMA OF THE LARYNX. REPORT OF A CASE.*

DR. CHARLES J. IMPERATORI, New York.

Rhabdomyoma of the larynx is a very rare occurrence for no cases have been reported in the literature and practically no attention is given to this type of connective tissue tumor in the textbooks on laryngology or pathology.

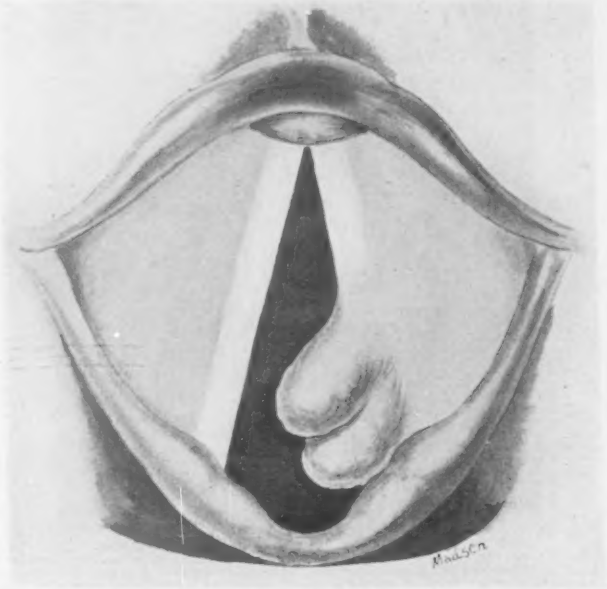

Fig. 1. Rhabdomyoma of the larynx. Lobulated growth attached to the posterior part of the right cord.

The report of the occurrence of such a tumor in the larynx of a young man may be of interest. H. S. M., age 23 years, premedical

*Read at the Annual Meeting of the American Laryngological Association, Washington, D. C., May 9, 1933.

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, April 15, 1933.

student, born in Nova Scotia. Up to one year ago his history relative to his larynx was negative. There is no history of voice trauma and he smoked very moderately.

Ten months previous to the first examination, Sept. 13, 1932, he gradually became hoarse. This increased in amount.

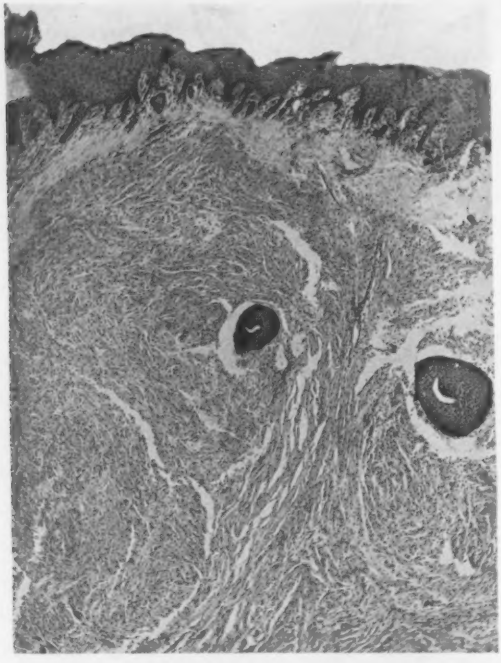

Fig. 2. Rhabdomyoma of the larynx. Photomicrograph. Low power. Showing an epithelial covering and a stroma behind it of spindle cells that on being stained show that they are striated muscle fibres. Intermingled with these muscle fibres there is a small amount of fibrous tissue.

He was seen by Dr. E. R. Faulkner, who referred him to me for excision of what appeared to be an atypical fibrous growth of the left vocal cord.

Physical examination was negative other than a lobular sessile growth that was attached to the posterior third of the left cord on its superior surface. There was no appearance of infiltration.

The growth was about the size of two green peas and light red in color.

There was considerable air wasting on phonation and the voice was hoarse. The right cord appeared to be normal.

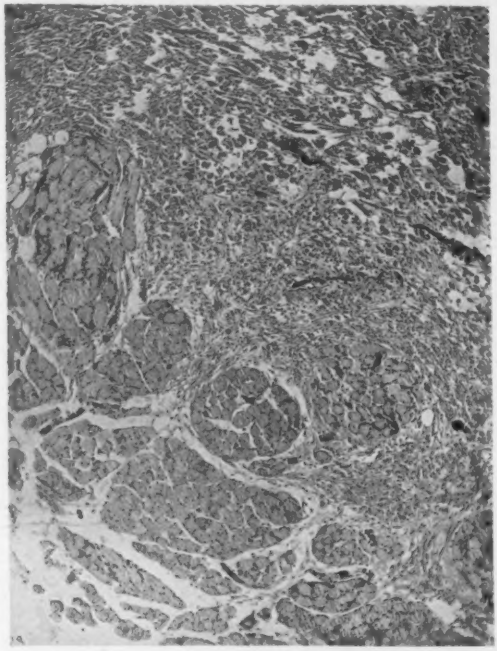

Fig. 3. Photomicrograph. High power. Showing muscle bundles and fibrous tissue stroma. The nuclei of the muscle fibres are easily seen.

Under local anesthesia and using a Jackson laryngostat, the growth was removed on Sept. 14, 1932, using a cup type of forceps and removing the remaining tags with a biting forceps. The pathological report is as follows:

Size, 15x7x6 mm. Coarsely papillary and firm. Cut surface is pale yellow and hemogeneous.

Microscopic: All of the tissue was sent through and sectioned. There is a covering of stratified squamous epithelium that shows

irregular thickening with irregular prolongations at the base. At one point the epithelium shows transition to the columnar type. Several ducts of mucous glands show metaplasia of the epithelial lining from columnar to squamous in type. The stroma beneath the epithelium is formed chiefly of spindle cells which seem to represent muscle fibres. With special staining these spindle cells are further identified as striated muscle fibres. They vary in size and shape. Some of them are embryonal in type, some of them are multinucleated and still others show communicating branches with central nuclei as in heart muscle. Mitotic figures are not found. Intermingled with the muscle fibres there is a small amount of fibrous tissue, especially beneath the epithelium.

Diagnosis: Rhabdomyoma.

Under date of Jan. 13, 1933, Dr. A. E. Doull, of Halifax, states that there is no recurrence of the growth and the patient's voice is of normal volume and quality.

108 East 38th Street.

QUININE UREA AS ANESTHESIA IN TONSILLECTOMY.*

DR. WALTER L. HOGAN, Hartford, Conn.

Anesthesia for tonsillectomy seems a very commonplace subject. This report of my experiences with and impressions after the use of quinine urea hydrochloride solution as an injection behind the tonsils covers a period of over two and a half years and may be of interest because I have used it quite generally, not alone in cases done under local anesthesia, but also in conjunction with cases operated upon under general anesthesia as a means of trying to alleviate the postoperative pain and discomfort. I believe that its use was prompted by reading in Fowler's "Tonsil Surgery"[1] in February, 1930, of the method of Trotter,[2] of Buffalo, in using one deeply placed injection of 0.5 per cent solution of quinine urea hydrochloride as a local anesthetic. Frequently in local anesthesia I have used one deeply placed injection of novocaine as originally suggested, I believe, by Gatewood, of New York.

METHOD IN LOCAL ANESTHESIA.

At first I used one-third per cent solution of quinine urea hydrochloride in the amount of about 2 cc. external to each tonsil in local anesthesia cases; however, I soon started to use novocaine, 1 per cent, distributed by injections at the upper and lower poles and in the middle of the anterior and posterior pillars to shorten the time necessary for the quinine urea solution to take effect, i. e., about twelve to fifteen minutes, and also to be certain that a sufficient anesthesia was obtained, as I was somewhat reluctant to use 0.5 per cent in strength and in sufficient amount at first. These first patients were so comfortable, very seldom requiring an opiate even once after operation, and as there was no sign of sloughing in the tissues due to the quinine urea solution, it was decided to increase the strength to 0.5 per cent and the amount to 2.5 to 3 cc. Usually about 8 cc. is put out on the table for each case and to this is added five or six drops of adrenalin, 1:1,000

*Read before the Hartford County Medical Society, April 4, 1933.

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solution. The size and contour of the tonsil and whether or not it is deeply placed is noted and then after touching the point of entry with mercurochrome the needle is inserted external to middle of the tonsil, about on a level with the third lower molar tooth, if present, and to a depth of about 2 to 3 cm. After making sure that a vessel has not been punctured, 2.5 to 3 cc. are injected. In local cases this is supplemented by 2 cc. of novocain, 1 per cent, to an ounce of which six drops of adrenalin, 1:1,000, are added. Five to seven minutes is allowed for the anesthetic to take effect and then the operation is started. Previous to the injection a cotton-tipped applicator is dipped in 5 per cent cocaine solution, the excess squeezed out and then applied to the pillars, the uvula and the posterior pharyngeal wall to lessen irritability and the tendency to gag.

METHOD IN GENERAL ANESTHESIA.

These cases seemed to be so comfortable that I soon started to use this injection of quinine urea solution in adult cases done under general anesthesia. As soon as the mouth gag is inserted, the point of injection is touched with mercurochrome and then the usual deep injection is made. Often this can be done before the patient is sufficiently anesthetized with gas-ether to proceed with the operation. If some minutes were allowed to elapse, this would act as a nerve block in conjunction with the inhalation anesthesia, but the primary purpose is to lessen to a great extent the postoperative pain and discomfort. Then also, there probably is some vasoconstrictor effect of the small amount of adrenalin solution. As far as I know there have been no injections of quinine urea solution previously used in connection with inhalation anesthesia. Since writing this, however, I have learned that Trotter has used this in connection with general anesthesia.

POSTOPERATIVE CARE.

The effect of this injection seems to last for several days through the part of the postoperative period which ordinarily is most uncomfortable. This seems particularly desirable in patients requiring secondary tonsillectomy, where perhaps the "top of the tonsils was clipped off" in childhood and large buried stumps remain surrounded by more or less scar tissue, and which patients often seem to have more postoperative pain after the tonsil tissue has been dissected out. Anesthetic lozenges are to many people nauseating and disagreeable and often do not "touch the spot." Gargles likewise often are difficult to use postoperatively and seem inadequate. While perhaps not strictly coming under the title of this paper, it might be

stated that for several years I have had patients use throat irrigations or douches of two quarts of a hot, weak solution of sodium chloride and sodium bicarbonate every two hours, beginning the day after operation and continuing for a week or so until the discomfort has ceased. For years none of these patients has had sutures and this is also thought to have lessened the postoperative pain. Bleeding is controlled by ligatures as it occurs. At the end of operation, bismuth subnitrate powder is insufflated or put into the tonsil fossae to cover over the raw surface. The general observation is that the younger a child is the less likely he is to suffer pain and annoyance after tonsil operation. However, in a few children as young as five years, smaller amounts, i. e., 1 cc., have been injected. Occasionally in operating in some other hospital than the one in which usually these cases are done, the quinine urea solution is not readily available, and I have not used it; however, it does seem as if the adult cases were not as comfortable.

CASE REPORTS.

Records of ninety-two cases are readily available in which quinine urea has been used. Of these, fourteen were under local anesthesia, seventy-three cases with inhalation anesthesia and five adults with "Avertin." Of these seventy-eight cases done under general anesthesia, two patients supposedly had had their tonsils removed by diathermy, one of them had had many diathermy treatments for over two years; six cases had had a previous peritonsillar abscess, and ten had had previous surgical tonsillectomies. The youngest were two who were 5 years of age, one was 10 years old and two were 13. Otherwise the records show that quinine urea was used only in patients over 15 years of age. The oldest patient was 61 and tonsillectomy for her had been advised by a very good laryngologist in another city in the State. This was done under quinine urea and novocaine only, her systolic blood pressure being 180 at the time, and she had an uneventful operation and convalescence. Probably the chief hesitancy in the use of injections of quinine urea solution is the fear that it will cause sloughing. This may be true, if the injection is very superficial, but no signs of sloughing have been observed in the cases above reported. Since writing this, Trotter[3] reports having used quinine urea solution in 1 per cent strength, 2 cc. for each tonsil, without sloughing. Also, he reports using equal parts of quinine urea, 1 per cent, and novocaine, 1 per cent, with adrenalin for the purpose of shortening the waiting time. In my humble opinion there is a use for quinine urea solution in tonsil

surgery and it is hoped that this paper may suggest further use and investigation in this field.

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3. Trotter, H. A.: Personal communication to the writer.

750 Main Street.

IN MEMORIAM

THEODORE C. LYSTER

1875-1933

Dr. Theodore C. Lyster, Brigadier General, U.S.A., Retired, died in Los Angeles Aug. 5, 1933, of angina pectoris, aged fifty-eight years.

He received his medical degree from the University of Michigan Medical School at Ann Arbor, in 1899; was a veteran of the Spanish-American War, entering the army as assistant surgeon in 1900 and promoted through the various grades to that of Lieutenant Colonel in 1917, and in 1919 was retired with the rank of Colonel. By an Act of Congress in June, 1930, he was promoted to Brigadier General, Retired. In 1917-18 he was Chief of Aviation and Professional Services in the Surgeon General's office, for which he was awarded the Distinguished Service Medal. For four years he was Director of Yellow Fever Elimination Work for the Rockefeller Foundation. At one time he was Chief of Eye, Ear, Nose and Throat at Ancon (Canal Zone) Hospital, and Chief of Eye Service in the University of the Philippines, Manila; in 1913, during the American occupation, he was Chief Health Officer at Vera Cruz, Mexico.

Qualified as an Ophthalmologist and Oto-Laryngologist, much of the service that he rendered during his association with the U.S. Army has been in these special fields. His special contributions have been in conjunction with aviation work and the study of static labyrinth reactions which proved to be so important a factor during this period.

He was a member of the American Laryngological, Rhinological and Otological Society and the Pacific Coast Oto-Ophthalmological Society; Fellow of the American College of Surgeons; Vice-President of the Southern California Medical Association; Associate Clinical Professor of Ophthalmology, University of Southern California School of Medicine; member of the Eye Service of Good Samaritan, Los Angeles County, St. Vincent's, and Hollywood Hospitals.

His personality and charm stimulated all with whom he came in contact; he was a cultured gentleman, an indefatigable worker, a loyal friend, and inspired by the highest ideals for his profession and for humanity.

In offering this tribute we also desire to express our sympathy to Mrs. Lyster, who survives him. M. A. G.

LEWIS AUGUSTUS COFFIN, M.D.

1856-1933

Dr. Lewis A. Coffin, able veteran in Laryngology, died in New York Oct. 30, 1933.

Dr. Coffin was born in Lisbon, N. Y., in 1856; was educated at Pottsdam Normal School, graduated from Union College in 1882 and from the Medical School of New York University in 1885.

For some years Dr. Coffin practiced general medicine and later specialized in Rhino-Laryngology. He began his association with the Manhattan Eye, Ear and Throat Hospital in 1886, became a Director and Attending Surgeon of this institution in 1899, which position he held until his retirement in 1924.

He was President of the American Laryngological, Rhinological and Otological Society in 1922, and President of the American Laryngological Association in 1930. In 1931 he received the Honorary Degree of Master of Science from Union College. He was a Founder and Director of the Society for the Relief of Widows and Orphans of Medical Men.

He was a keen observer, a careful diagnostician and always dependable for good judgment and human interests in his professional and personal contacts; frank and outspoken in his opinions, and impartial in his esteem of his colleagues and their work.

He was particularly interested and did extensive work and research in sinus infections, particularly sinusitis in children. He has contributed numerous articles especially on this subject to enrich laryngological literature.

He was an active and earnest worker among the Old Guard in Laryngology and his valuable counsel and genial personality will live in the memory of his colleagues and friends. M. A. G.